DIGITAL LOGIC Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE101-S1	**Digital Logic**	1	4	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Khalis A. Mohammed**
Instructor(s) of the Course Unit	**Khalis A. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	1. To learn the basic techniques and methodologies for designing and analyzing digital systems and how to apply these techniques to build specific circuits. 2. Define the problem (Inputs and Outputs), write its functions 3. Implement functions using Combinational digital circuit. 4. Minimize functions using any type of minimizing algorithms (Boolean algebra, Karnaugh-Map or Tabulation Method). **5.** Have knowledge in analyzing and designing procedures of Combinational digital circuits.
Contents of the Course Unit:	1- Numbers Systems, Operations, and Codes. 2- 2- Logic Gates 3- Boolean Algebra and Logic Simplification 4- Combinational Logic Analysis

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**1- Numbers Systems, Operations, and Codes**: Decimal Numbers, Binary numbers.
2	**1- Numbers Systems, Operations, and Codes**: Hexadecimal Numbers, Octal numbers.
3	**1- Numbers Systems, Operations, and Codes**: Data representation (integer and fraction) using different number systems. Conversion Between Different Numbers Systems .
4	**1- Numbers Systems, Operations, and Codes:** Arithmetic operations using 9's and 10's Complements of Decimal Numbers. Arithmetic operations using 1's and 2's Complements of Binary Numbers.
5	**1- Numbers Systems, Operations, and Codes:** Signed Numbers, Arithmetic Operations with Signed Numbers.
6	**1- Numbers Systems, Operations, and Codes**: Digital Codes (BCD, Excess-3, Parity, Gray ..... etc.).
7	**2- Logic Gates:** The Inverter (NOT Gate), The AND Gate, The OR Gate.
8	**2- Logic Gates:** The NAND Gate, The NOR Gate, The Exclusive-OR Gate and Exclusive-NOR Gate.
9	**3- Boolean Algebra and Logic Simplification:** Boolean Operations and Expressions.
10	**3- Boolean Algebra and Logic Simplification:** Laws and Rules of Boolean Algebra.
11	**3- Boolean Algebra and Logic Simplification** Simplification Using Boolean Algebra. DeMorgan's theorems.
12	**3- Boolean Algebra and Logic Simplification :** The Karnaugh Map (1, 2 , 3 and 4 variables) , SOP and POS Minimization.
13	**4- Combinational Logic Analysis:** Basic Combinational Logic Circuits.

	Implementing Combinational Logic.
14	**4- Combinational Logic Analysis:** Combinational Logic Using NAND and NOR Gates. Logic Circuit Operation with Pulse Waveform Inputs.
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to digital laboratory kit operation
2	**Lab 2:** Logic Gates (AND, OR, NOT, NAND, NOR).
3	**Lab 3:** Logic Gates (XOR, XNOR).
4	**Lab 4:** Design of (AND, OR, NOT) gates Using NAND gates.
5	**Lab 5:** Design of (AND, OR, NOT) gates Using NOR gates.
6	**Lab 6:** Implementation of logic circuits using NANAD-gate only.
7	**Lab 7:** Implementation of logic circuits using NOR-gate only.
8	**Lab 8:** Implementation of DeMorgan theory, 1st Law
9	**Lab 9:** Implementation of DeMorgan theory, 2nd Law
10	**Lab 10**: Design of a combinational logic circuits . Part 1
11	**Lab 11**: Design of a combinational logic circuits. Part 2
12	**Lab 12**: Realization of Boolean equation. Part 1
13	**Lab 13**: Realization of Boolean equation. Part 2
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCTE101-S1**	**DIGITAL LOGIC**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	3	6
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**86**	**63**	**175**
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

DIGITAL CIRCUITS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE101-S2	**Digital Circuits**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Khalis A. Mohammed**
Instructor(s) of the Course Unit	**Khalis A. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To learn the basic techniques and methodologies for designing and analyzing digital circuits such as Adder – subtractor circuits. • To learn the Decoder and Encoder circuits. • To learn the Comparator, Multiplexer and Demultiplexer circuits. • To learn and analysis sequential circuits such as flip-flop circuits and Registers. • To learn the types of counters.
Contents of the Course Unit:	1 – Functions of Combinational Logic. 2 – Latches, Flip-Flops, and Timers. 3 – Counters 4 – Shift Registers

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**1- Functions of Combinational Logic.** Basic Adders; Half and Full Adders.
2	**1- Functions of Combinational Logic.** Basic Subtractors; Half and Full Subtractors.
3	**1- Functions of Combinational Logic.** Parallel Binary Adders and Subtractors. 1's ,2's Complement Subtractor, 2's Complement Adder-Subtractor, BCD Adder, etc.
4	**1- Functions of Combinational Logic.** Comparators, Code converters.
5	**1- Functions of Combinational Logic.** Decoders, Encoders.
6	**1- Functions of Combinational Logic.** Multiplexers (Data Selectors), Demultiplexer.
7	**2- Latches, Flip-Flops, and Timers.** Latches
8	**2- Latches, Flip-Flops, and Timers.** Edge-Triggered Flip-Flops.
9	**2- Latches, Flip-Flops, and Timers.** Flip-Flop operating (R-S, T, J-K ,D)
10	**3- Counters** Synchronous Counters.
11	**3- Counters** Asynchronous Counters.
12	**3- Counters** Design of Counters.
13	**4- Shift Registers** Basic Operations, Serial In/Serial out Shift Registers, Serial In/Parallel out Shift Registers.
14	**4- Shift Registers** Parallel In/Serial Out Shift Registers, Parallel In/parallel Out Shift Registers, Bidirectional Shift Registers.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Half Binary Adder
2	**Lab 2:** Full Binary Adder
3	**Lab 3**: Half Binary Subtractor
4	**Lab 4:** Full Binary Subtractor
5	**Lab 5:** 2's Complement Adder-Subtractor
6	**Lab 6:** Binary Comparator
7	**Lab 7:** Digital Multiplexer
8	**Lab 8:** DeMultiplexer.
9	**Lab 9:** Decoders
10	**Lab 10:** Encoders
11	**Lab 11:** D Flip-Flop
12	**Lab 12:** JK- Flip-Flop
13	**Lab 13:** T- Flip-Flop
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE101-S2	DIGITAL CIRCUITS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**2**	**30**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**2**	**28**
Reading	6	1	6
Assignment (Homework)	3	2	6
Project Work	3	4	12
Seminar	**3**	**1**	**3**
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	6	3	18
Final Exam	**1**	**3**	**3**
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1		
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	3	2	2
Preparation for the Short Exam	3	3	10
TOTAL WORKLOAD OF THE COURSE UNIT	**50**	**55**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

MATHEMATICS Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE102-S1	**Mathematics**	1	3	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Ayhan Ahmed Khaleel**
Instructor(s) of the Course Unit	**Ayhan Ahmed Khaleel**

OBJECTIVES AND CONTENTS	Help the student to understand the laws and issues necessary for the purpose of solving simple and complex electrical circuits.
Objectives of the Course Unit:	To learn the
Contents of the Course Unit:	1- Matrix and Determinants 2- Review of Functions 3- Derivatives 4- Integration

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Matrix, properties, and operations
2	Determinants and properties of determinants Inverse of square matrix by determinants
3	Solving linear System equations using the inverse of the coefficient matrix and Cramer's rule
4	Algebraic functions
5	Review of natural logarithm, the exponential function, trigonometric functions
6	inverse trigonometric functions and hyperbolic functions
7	Derivatives formula and chain rule.
8	Derivatives of natural logarithm, the exponential function, trigonometric functions
9	inverse trigonometric functions and hyperbolic functions.
10	Applications of differentiation.
11	Review of Integration, Indefinite and Definite Integral
12	Integration method
13	Integration method
14	Applications of integration, approximation(trapezoidal rule, Simpson's rule) Area between curves
15	**Final Exam**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE102-S1	MATHEMATICS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	3	45
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	NA	NA	NA
Reading	NA	NA	NA
Assignment (Homework)	13	1	13
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	NA	NA	NA
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	16	16
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**53**	**49**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

ENGINEERING MATHEMATICS Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE102-S2	**Engineering Mathematics**	2	3	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Ayhan Ahmed Khaleel**
Instructor(s) of the Course Unit	**Ayhan Ahmed Khaleel**

OBJECTIVES AND CONTENTS	introduce students to mathematics through the laws and issues necessary for the purpose of assisting them in their studies in their field of specialization.
Objectives of the Course Unit:	To learn the
Contents of the Course Unit:	1- Complex numbers 2- Multivariable functions and partial derivatives 3- Vector and analytic geometry in space 4- Vector valued functions 5- Multiple Integrals

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Complex numbers in Cartesian coordinates and polar from
2	linear algebra for complex number in polar and Cartesian Euler's formula.
3	DeMoivre's theorem to find powers and the nth roots of given complex numbers
4	Functions of several variables
5	Partial differentiation and the chain rule
6	Functions of a complex variable, Cauchy-Riemann equations
7	Cartesian coordinates and vectors in space, Dot product and Cross product
8	Lines and planes in space, Tangent and normal in the plane
9	The two-dimensional Coordinate system, The three dimensional Coordinate .
10	Directional derivatives, Gradient vectors
11	Divergence, curl and the laplacian
12	Double Integral in rectangular and polar form, Areas and volumes
13	Triple integrals in rectangular coordinates
14	Applications (Surface Area, Green's theorem and Stokes' theorem)
15	**Final Exam**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE102-S2	ENGINEERING MATHEMATICS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	3	45
Tutorial	**13**	**1**	**13**
Preliminary & Further Study	5	3	15
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	NA	NA	NA
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	NA	NA	NA
Final Exam	1	3	3
Preparation for the Final Exam	1	18	18
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	11	11
Short Exam (Quizzes)	4		
Preparation for the Short Exam	4	2.5	10
TOTAL WORKLOAD OF THE COURSE UNIT	**53**	**41.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

COMPUTER ORGANIZATION Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE103-S1	**Computer Organization**	1	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Mohammed G. Ayoub**
Instructor(s) of the Course Unit	**Mohammed G. Ayoub**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	**At the end of this course, following learning objectives are expected to be achieved:** - To understand principles of computer organization and the basic architectural concepts. - To understand the structure, function and characteristics of computer systems. - To understand how the various components of Computer Systems fit together and interact. - To explain the function of each element of a memory hierarchy.
Contents of the Course Unit:	1- Computer Architecture 2- Memory Hierarchy 3- CPU and GPU 4- Computer Bus 5- Semiconductor Memory - Read and Write Operations in Memory 6- Assembly Programming 7- Intel Microprocessors

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Computer Systems:** Computer Characteristics, Software and Computers Categories
2	**Introduction to Computer Architecture:** Von Neumann and Harvard Architectures
3	**The Memory Hierarchy:** Registers, Caches, Main Memory, Hard Disk and Auxiliary Storage
4	**Average Memory Access Time (AMAT):** Computing AMAT, Cache Miss and Cache Hit
5	**Types of CPU Register and their Functions:** Operations of CPU Registers, Types and Functions
6	**Computer Bus | Types and Functions:** Data Bus, Address Bus, Control Bus, Internal and External Buses
7	**Basics of Semiconductor Memory | Types & Technologies Part I:** Memory Array, Memory Address, Memory Capacity, Read and Write Operations in Memory
8	**Basics of Semiconductor Memory | Types & Technologies Part II:** SRAM, DRAM, RAM Family, ROM Family
9	**Basics of Semiconductor Memory | Types & Technologies Part III:** Flash Memory, Magnetic Storage, Optical Storage and Cloud Storage System
10	**Basic Operation of Processors:** Fetch/Execute Cycle, Pipelining and Processor Elements
11	**Levels of Programming Languages:** Assembly Language and Machine Language
12-14	**Introduction to the Intel Microprocessors:** 4004,8080/8085,8086/8086 80386,80486 and Multicore
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to Computer System Parts
2	**Lab 2:** Peripherals Devices
3	**Lab 3**: Computer Monitors
4	**Lab 4:** Computer Cables
5	**Lab 5:** Types of Microprocessors
6	**Lab 6:** Types of Memory in Computer System
7	**Lab 7:** Storage in Computer System
8	**Lab 8:** Motherboards and Graphics Card
9	**Lab 9:** Types of Computer Ports
10	**Lab 10:** Computer Software Part I
11	**Lab 11:** Computer Software Part II
12	**Lab 12:** Programming Languages
13	**Lab 13:** Computer Networks
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit :	**BCTE103-S1**	**COMPUTER ORGANIZATION**	
Workload For Learning & Teaching Activities			
Type of the Learning activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	**15**	**2**	**30**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**2**	**28**
Reading	NA	NA	NA
Assignment (Homework)	**6**	**2**	**12**
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Seminar Preparation	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	**5**	**1**	**5**
Final Exam	**1**	**3**	**3**
Preparation for the Final Exam	**1**	**6**	**6**
Mid-Term Exam	**1**	**2**	**2**
Preparation for the Mid-Term Exam	**1**	**3**	**3**
Short Exam (Quizzes)	**8**		
Preparation for the Short Exam	**8**	**0.5**	**4**
Total Workload of the Course Unit	**60**	**21.5**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

COMPUTER PROGRAMMING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE103-S2	**Computer Programming**	2	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Najwan Z. Waisi**
Instructor(s) of the Course Unit	**Najwan Z. Waisi**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the students with computer programming techniques using C++ language, and how it can be used to solve problems related to their specialization.
Contents of the Course Unit:	To learn the 1- Introduction to C++. 2- Operators & Making Decisions 3- Looping & Arrays 4- Pointers & Functions.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to C++ (Structure of a program)
2	Variables, Data Types, Declaration of variables, Scope of variables, Initialization of variables, Expressions and Basic Input/Output.
3	Operators (Assignment, Arithmetic operators, Compound assignment, Increase and decrease, Relational and equality operators, Conditional operator)
4	Making Decisions (if...else and switch).
5	Looping (while loop and for loop).
6	Bitwise Operators and Explicit type casting operator
7	Arrays (Single Dimensional arrays, Arrays as parameters)
8	Arrays (two Dimensional arrays, Arrays as parameters)
9	Character Sequences and String handling.
10	Structure
11	Pointers (Reference operator, dereference operator, Declaring variables of pointer types,)
12	Pointers and arrays, Pointers to pointers, void pointers and Pointers to functions
13	Functions (Local and global variables, Arguments passed by value and by reference, Default values in parameters)
14	Overloaded functions and Recursive functions.
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to C++ program using visual studio .
2	**Lab 2:** my first program and how solve a problem.
3	**Lab 3:** if...else and switch programs
4	**Lab 4:** while loop and for loop programs
5	**Lab 5:** Bitwise Operators programs
6	**Lab 6:** Single Dimensional arrays
7	**Lab 7:** two Dimensional arrays ..part1
8	**Lab 8:** two Dimensional arrays..part2
9	**Lab 9:** Character and String programs
10	**Lab 10**: how implement a Structure
11	**Lab 11**: Pointers and arrays
12	**Lab 12**: Functions..part1
13	**Lab 13**: Functions..part2
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCTE103-S2**	COMPUTER PROGRAMMING	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**2**	**30**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**2**	**28**
Reading	NA	NA	NA
Assignment (Homework)	2	1	2
Project Work	NA	NA	NA
Seminar	**1**	**1**	**1**
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	6	1	6
Final Exam	1	3	3
Preparation for the Final Exam	1	12	12
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	6	6
Short Exam (Quizzes)	4		
Preparation for the Short Exam	4	3	12
TOTAL WORKLOAD OF THE COURSE UNIT	**50**	**33**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

ENGINEERING DRAWING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE104-S1	**Engineering Drawing**	1	3	2	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Naqaa L. Mohammed**
Instructor(s) of the Course Unit	**Naqaa L. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	1. Define engineering drawing material, its uses and Engineering drawing tools 2. Introduction to Engineering drawing through AutoCAD software 3. Developing the student's mental and abilities in drawing simple and complex shapes Decomposes 3D shapes into binary projections
Contents of the Course Unit:	1- Introduction to AutoCAD software 2- Draw menu 3- modify menu 4- Layers and properties 5- projection 6- stereoscopic shapes

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	-Get a quick introduction to AutoCAD -Drawing Setup in AutoCAD -Use precision drawing tools such as Grid, Object Snap, and Limits to create accurate measurements in drawings.
2	Coordinate method (Direct distance method, Absolute coordinate, Relative coordinate, Polar coordinate)
3	Draw menu (line, poly line, polygon, rectangle).
4	Drawing objects of Pentagonal, hexagonal and octagonal shapes
5	Draw menu (arc, circle, ellipse, point and text).
6	Draw several shapes containing circles and texts
7	Modify menu (erase, copy, mirror, move offset,)
8	Modify menu (rotate, trim, extend, explode)
9	Properties and Layers in AutoCAD and dimension
10	Orthographic projection
11	Draw the three projection(front, side and top) of some shapes
12	Basics of drawing stereoscopic shapes
13	Draw stereoscopic shape
14	Printing the graphic
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Definition of AutoCAD interface
2	**Lab 2:** Applications of Coordinate method
3	**Lab 3:** Draw figures of lines, polygons and rectangle
4	**Lab 4**: Drawing objects of Pentagonal, hexagonal and octagonal shapes
5	**Lab 5**:Drawing figures of circles and ellipse
6	**Lab 6**: Draw several shapes containing circles and texts
7	**Lab 7:** Applications of some order in modify menu
8	**Lab 8**: Applications of other order in modify menu
9	**Lab 9**: Practicing of using layers
10	**Lab 10:**Practicing of projection of simple figure
11	**Lab 11**: Draw three projection of figure
12	**Lab 12**: Practicing of drawing stereoscopic shapes
13	**Lab 13**: Draw stereoscopic shape
14	**Lab 14:** Practicing of Printing the graphic

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE104-S1	ENGINEERING DRAWING	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	1	14
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	5	1	5
Project Work	1	1	1
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	NA	NA	NA
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	5	5
Short Exam (Quizzes)	4	1	4
Preparation for the Short Exam	3	1	3
TOTAL WORKLOAD OF THE COURSE UNIT	**45**	**27**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

ELECTRONIC WORKSHOP Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE104-S2	**Electronic Workshop**	2	2	1	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Thabat F. Thabet**
Instructor(s) of the Course Unit	**Dr. Thabat F. Thabet**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To learn the basics of electrical elements (Symbols and Abbreviations, Units). • To learn how to use measurement devices for DC and AC • How to measure electrical elements by using measurement devices • To learn the basics of electronic devices • How to test electronic devices by using measurement devices • How to use Oscilloscope (CRO) • How to use Function Generator
Contents of the Course Unit:	1 – Electrical elements (Resistors, Capacitors) 2 – Measurement devices (AVO-meters). 3 – How to measure Direct Current DC and Alternative current AC. 3 – Electronic Devices (Diodes and Transistors) 4 – Oscilloscope (CRO) 5 - Function Generator

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:

No.	PRACTICAL PART
1	**Lab 1:** Basic information
2	**Lab 2:** Color of resistance
3	**Lab 3**: Capacitors values
4	**Lab 4:** Measurement devices
5	**Lab 5:** How to measure resistors and capacitors values
6	**Lab 6:** How to measure DC and AC values
7	**Lab 7:** Diodes
8	**Lab 8:** Transistors.
9	**Lab 9:** Operating of Oscilloscope (CRO)
10	**Lab 10:** Function Generator
11	**Lab 11:** DC circuit
12	**Lab 12:** AC circuit
13	**Lab 13:** Electric circuit schematic diagram
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE101-S1	DIGITAL LOGIC	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	1	2	2
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	**14**	**2**	**28**
Reading	NA	NA	NA
Assignment (Homework)	4	1	4
Project Work	1	5	5
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	**2**	**1**	**2**
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	4	3	12
Final Exam	NA	NA	NA
Preparation for the Final Exam	NA	NA	NA
Mid-Term Exam	NA	NA	NA
Preparation for the Mid-Term Exam	NA	NA	NA
Short Exam (Quizzes)	6		
Preparation for the Short Exam	6	3	18
TOTAL WORKLOAD OF THE COURSE UNIT	**42**	**18**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

FUNDAMENTALS OF ELECTRICAL ENGINEERING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE105-S1	**Electrical Engineering Fundamentals**	1	4	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Maysaloon A. Qasim**
Instructor(s) of the Course Unit	**Dr.Maysaloon A. Qasim**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To provide the fundamental concept of DC electrical circuits.
Contents of the Course Unit:	1-General Electric System. 2- DC circuits. 3- Network Theorems

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**1- General Electric System:** Constituent parts of an electrical system (source, load, communication & control), Current flow in a circuit, Electromotive force and potential difference, Electrical units.
2	**1- General Electric System:** Ohm's law, Resistors, Resistivity, Temperature rise & Temperature coefficient of resistance, Voltage & Current sources
3	**2- DC circuits**: Series circuits , Parallel circuits.
4	**2- DC circuits**: Kirchhoff's laws.
5	**2- DC circuits**: Power and energy .
6	**3- Network Theorems:** Star-delta & delta-star transformation
7	**3- Network Theorems:** Sources transformations
8	**3- Network Theorems:** Mesh analysis.
9	**3- Network Theorems:** Nodal analysis.
10	**3- Network Theorems:** Superposition theorem.
11	**3- Network Theorems:** Thevnin's theorem
12	**3- Network Theorems:** Nortan's theorem
13	**3- Network Theorems:** Maximum power transfer theorem.
14	**3- Network Theorems:** Reciprocity theorem
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Connection of resistances in series and parallel.
2	**Lab 2:** Verification of Ohm's law using hardware .
3	**Lab 3:** Verification of Ohm's law using digital simulation.
4	**Lab 4:** Verification of Kirchhoff's current law and Voltage law using hardware.
5	**Lab 5:** Verification of Kirchhoff's current law and Voltage law using digital simulation.
6	Lab 6: Determination of mesh currents using hardware.
7	Lab 7: Determination of mesh currents using digital simulation.
8	**Lab 8:** Measurement of nodal voltages using hardware and digital simulation.
9	**Lab 9:** Verification of superposition theorem using hardware .
10	**Lab 10:** Verification of superposition theorem using digital simulation.
11	**Lab 11:** Verification of Thevnin's theorem using hardware.
12	**Lab 12:** Verification of Thevnin's theorem using hardware.
13	**Lab 13:** Verification of Nortan's using hardware.
14	**Lab 14:** Verification of Nortan's using digital simulation.

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT : BCTE105-S1 ELECTRICAL ENGINEERING FUNDAMENTALS			
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	3	6
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**86**	**63**	**175**
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

ELECTRICAL CIRCUITS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE105-S2	**Electrical Circuits**	2	2+2	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Maysaloon A. Qasim**
Instructor(s) of the Course Unit	**Dr. Maysaloon A. Qasim**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To teach the fundamental concept of AC & 3-phase electrical circuits. • To teach fundamentals of Electric Circuits, their components and the mathematical Tools used to represent and analyze AC electrical circuits including resistors, capacitors, and inductors, dependent and independent sources.
Contents of the Course Unit:	1 – Inductance & Capacitance in Electric circuits. 2 – Alternating Quantities. 3 – Single-phase AC Circuits. 4 – Power in AC Circuits. 5- Three-Phase Circuit Analysis.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**1- Inductance & Capacitance in Electric circuits.** 1-General concept of capacitance (charge and voltage, capacitors in series and parallel) 2- General concept of inductance (inductive and non-inductive circuits, capacitors in series and parallel)
2	**2- Alternating Quantities.** Ac systems, waveforms, terms and definitions.
3	**2- Alternating Quantities.** Average and R.M.S values of current and voltage.
4	**2- Alternating Quantities.** Phasor diagram
5	**3- Single - phase of AC Circuits.** AC in resistive circuits , current and voltage in inductive circuits, current and voltage in capacitive circuits.
6	**3- Single - phase of AC Circuits.** Concept of complex impedance and admittance , AC series and parallel circuits .
7	**3- Single - phase of AC Circuits.** RL , RC and RLC circuit analysis and phasor representation.
8	**4- Power in AC circuits.** Power in resistive circuits ,power in inductive and capacitive circuits ,power in circuit with resistance and reactance.
9	**4- Power in AC circuits.** Power factor ,its practical importance , improvement of power factor , measurement of power in a single – phase AC circuits.
10	**5- Three – phase circuit analysis.** Basic concept and advantages of three – phase circuit.
11	**5- Three – phase circuit analysis.** Phasor representation of star and delta connection.
12	**5- Three – phase circuit analysis.** Phase and line quantities.
13	**5- Three – phase circuit analysis.** Voltage and current computation in 3-phase balance and unbalance circuits.
14	**5- Three – phase circuit analysis.** Real and Reactive power computation , measurement of power and power factor in 3-phase system.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Measurement amplitude, frequency and time with oscilloscope using hardware and digital simulation.
	Lab 2: Examine phase relation in RL & RC circuit using hardware and digital simulation.
2	**Lab 3:** Calculate & verify average and RMS value,
3	**Lab 4**: Impedance of series RL and RC circuit using digital simulation..
4	**Lab 5:** Impedance of series RLC circuit using digital simulation..
5	**Lab 6:** Determination of average value, RMS value, form factor, peak factor of sinusoidal wave using digital simulation.
6	**Lab 7:** Measure currents and voltages in three-phase balanced AC circuits
7	**Lab 8:** Prove Y-Δ transformation,
	Lab 9: Exercise on phasor diagrams for three-phase circuits
8	**Lab 10:** Measurement of voltage, current& power in a three-phase circuit
9	**Lab 11:** Ohm's LAW, KVL AND KCL in AC circuits using digital simulation..
10	**Lab 12:** Determination of mesh currents in AC circuits using digital simulation.
11	**Lab 13:** Measurement of nodal voltages in AC circuits using digital simulation.
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCTE105-S2**	**ELECTRICAL CIRCUITS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	3	6
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**86**	**63**	**175**
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

DEMOCRACY AND HUMAN RIGHTS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
NTU100	**Democracy and Human Rights**	1	2	2	2

GENERAL INFORMATION	
Language of Instruction:	**Arabic**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr .Eesha I. Mohammed**
Instructor(s) of the Course Unit	**Dr .Eesha I. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	**أهداف مادة حقوق الانسان والديمقراطية:** تعريف الطالب بحقوق الانسان والديمقراطية ومضامينها وتصنيف الحريات العامة
Contents of the Course Unit:	**المحتويات:** تعريف الطالب على مفهوم الحقوق والديمقراطية على الصعيد الوطني والاقليمي والعالمي

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	حقوق الانسان ، تعريفها ، اهدافها حقوق الانسان في الحضارات القديمة وخصوصا حضارة وادي الرافدين
2	حقوق الانسان في الشرائع السماوية مع التركيز على حقوق الانسان في الاسلام
3	حقوق الانسان في التاريخ المعاصر والحديث : الاعتراف الدولي بحقوق الانسان منذ الحرب العالمية الأولى وعصبة الامم المتحدة
4	الاعتراف الاقليمي بحقوق الانسان : الاتفاقية الاوربية لحقوق الانسان 1950 ، الاتفاقية الامريكية لحقوق الانسان 1969 ، الميثاق الافريقي لحقوق الانسان 1981 ، الميثاق العربي لحقوق الانسان 1994
5	حقوق الانسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين حقوق الانسان ، المنظمات الوطنية لحقوق الانسان)
6	حقوق الانسان في الدساتير العراقية بين النظرية والواقع
7	حقوق الانسان الاقتصادية والاجتماعية والثقافية و حقوق الانسان المدنية والسياسية
8	حقوق الانسان الحديثة : الحقائق في التنمية ، الحق في البيئة النظيفة ، الحق في التضامن ، الحق في الدين
9	ضمانات احترام وحماية حقوق الانسان على الصعيد الوطني ، الضمانات في الدستور والقوانين. الضمانات في الرقابة الدستورية ، الضمانات في حرية الصحافة والرأي العام ، دور المنظمات غير الحكومية في احترام وحماية حقوق الانسان
10	ضمانات واحترام وحماية حقوق الانسان على الصعيد الدولي : - دور الأمم المتحدة ووكالاتها المتخصصة في توفير الضمانات - دور المنظمات الاقليمية (الجامعة العربية ، الاتحاد الأوربي ، الاتحاد الافريقي ، منظمة الدول الأمريكية ، منظمة آسيان) دور المنظمات الدولية الاقليمية غير الحكومية والرأي العام في احترام وحماية حقوق الانسان
11	مصطلح الديمقراطية ، نشأته، دلالته، تاريخ الديمقراطية.
12	الاسلام والديمقراطية ومساوئ الحكم الاستبدادي .
13	الانتقادات الموجهة للديمقراطية، ومحاسن النظام الديمقراطي.
14	الأنظمة الديمقراطية في العالم/الديمقراطية في العالم الثالث/ المشاكل التي تواجه البلدان العربية في التحول الديمقراطي
15	الامتحان النهائي

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	NTU100	DEMOCRACY AND HUMAN RIGHTS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	NA	NA	NA
Reading	6	0.5	3
Assignment (Homework)	NA	NA	NA
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	NA	NA	NA
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	5	5
Short Exam (Quizzes)	3	0.5	1.5
Preparation for the Short Exam	3	0.5	1.5
TOTAL WORKLOAD OF THE COURSE UNIT	**30**	**23.5**	**54**
Workload (h) / 25			**54÷25**
ECTS Credits allocated for the Course Unit			**2**

ENGLISH LANGUAGE Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
NTU101	**English Language**	2	2	2	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Younis Anas Younis**
Instructor(s) of the Course Unit	**Dr. Younis Anas Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the student to general English through reading, writing, listening, and speaking.
Contents of the Course Unit:	Grammar, Vocabulary, Reading, Speaking, Listening, and Everyday English

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Grammar:** Tenses, Questions, Questions words **Vocabulary:** Using a bilingual dictionary, Parts of speech, and Words with more than one meaning. **Everyday English:** Social expressions.
2	**Reading:** the many ways we communicate **Speaking:** Information gap **Listening:** Neighbors
3	**Grammar:** Present tenses: Present Simple, Present Continuous, have/have got **Vocabulary:** Describing countries, Collocation **Everyday English:** Making conversation
4	**Reading:** three people talk about their experiences **Speaking:** people's lifestyles **Listening:** what annoys you about the people in your life?
5	**Grammar:** Past tenses: Past Simple, Past Continuous **Vocabulary:** Irregular verbs, making connections, Nouns, verbs, and adjectives, Making negatives. **Everyday English:** Time expressions
6	**Reading:** Newspaper stories **Speaking:** Telling stories **Listening:** A radio drama
7	**Grammar:** Quantity, Articles **Vocabulary:** Buying things **Everyday English:** Prices and shopping
8	**Reading:** 'The best shopping street in the world' **Speaking**: Town survey, attitudes to shopping **Listening**: Buying things
9	**Grammar:** Verb patterns 1, Future intentions **Vocabulary:** Hot verbs **Everyday English:** How do you feel?
10	**Reading:** Hollywood kids **Speaking:** Being a teenager **Listening:** You've got a friend
11	**Grammar:** Comparative and superlative adjectives **Vocabulary:** Synonyms and antonyms **Everyday English:** Directions
12	**Reading:** 'A Tale of two millionaires' **Speaking:** comparing cities **Listening:** Living in another country
13	**Grammar:** Present Perfect and Past Simple **Vocabulary:** Past participles, Adverbs, Word pairs **Everyday English:** Short answers
14	**Reading:** Celebrity interview **Speaking:** Roleplay **Listening:** An interview with the band

15	**Final Exam**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**NTU101 ENGLISH LANGUAGE**		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	2	1	2
Laboratory	NA	NA	NA
Reading	NA	NA	NA
Assignment (Homework)	2	1	2
Project Work	NA	NA	NA
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	1	1
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	1	2
Final Exam	1	3	3
Preparation for the Final Exam	1	3	3
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	2	2
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	2	1	2
TOTAL WORKLOAD OF THE COURSE UNIT	**31**	**18.5**	**50**
Workload (h) / 25			**50÷25**
ECTS Credits allocated for the Course Unit			**2**

COMPUTER PRINCIPLES Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
NTU102	Computer Principles	2	3	2	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**A.L. Zaid A.Abdulrazzaq**
Instructor(s) of the Course Unit	**A.L. Zaid A.Abdulrazzaq**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	1. Studying computer principles. 2. Defining keyboards and mice. 3. Presenting principles of memories. 4. Explaining disc drives. 5. Explaining principles of windows.
Contents of the Course Unit:	• Computer types of: digital, analogues and hybrid. • Different memory types of: RAM, ROM, PROM, EPROM and EEPROM. • Different drives types of: magnetic and optical. Windows facilities of: Notepad, Wordpad, Paint, Accessories and others.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introducing to the Computer System Including: What is Computer? Computer System, Functions of Computer Input Storage Process & Output, Classification of Computers and Computer Units**
2	**Explaining Types of Computer Keyboards and Types of Keyboard Keys**
3	**Explaining Types of Computer Keyboards and Types of Keyboard Keys**
4	**Explaining Types of Computer Keyboards and Types of Keyboard Keys**
5	**Explaining Types of Computer Mice and Mouse Functions**
6	**Explaining Different Plugs and Ports for Some Computer Parts**
7	**Illustrating Computer Discs and Drives**
8	**Illustrating RAM, Non-Volatile and Cache Memories**
9	**Demonstrating Computer Hardware Parts and Definitions**
10	**Demonstrating Computer Hardware Parts and Definitions**
11	**Demonstrating Computer Hardware Parts and Definitions**
12	**Presenting Windows, Windows Desktop and Windows Taskbar**
13	**Presenting Windows, Windows Desktop and Windows Taskbar**
14	**Illustrating Start Menu and Windows Accessories**
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Computer System
2	**Lab 2:** Input and Output Storage
3	**Lab 3:** Types of Computer Keyboards
4	**Lab 4**: Types of Keyboard Keys
5	**Lab 5:** Computer Mice and Mouse Functions
6	**Lab 6:** Different Plugs and Ports for Some Computer Parts
7	**Lab 7:** Computer Discs and Drives
8	**Lab 8:** RAM, Non-Volatile and Cache Memories
9	**Lab 9:** Windows Desktop
10	**Lab 10:** Windows Taskbar
11	**Lab 11:** Windows Taskbar
12	**Lab 12:** Start Menu
13	**Lab 13:** Windows Accessories
14	**Lab 14:** Exam

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**NTU102 COMPUTER PRINCIPLES**		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**1**	**15**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**2**	**28**
Reading	NA	NA	NA
Assignment (Homework)	2	2	4
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	5	5
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	2	2
Short Exam (Quizzes)	2	1	
Preparation for the Short Exam	2	1	
TOTAL WORKLOAD OF THE COURSE UNIT	**44**	16	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

ARABIC LANGUAGE Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
NTU103	**Arabic Language**	2	2	2	2

GENERAL INFORMATION	
Language of Instruction:	**Arabic**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr .Eesha I. Mohammed**
Instructor(s) of the Course Unit	**Dr .Eesha I. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	**أهداف مادة اللغة العربية :** ينشأ الطالب على حب اللّغة العربيّة لغة القرآن الكريم. التعرّف على مواطن الجمال في اللّغة العربيّة وآدابها، وأن يكتسب الطالب القدرة على دراسة فروع اللّغة العربيّة. تعريف الطالب بألفاظ اللّغة العربيّة الصحيحة وتراكيبها وأساليبها السليمة بطريقة مشوقة وجذابة. أن يستغل الطالب وقت فراغه بالقراءة والاطلاع والرجوع إلى المكتبة . تمكين الطالب من القراءة الصحيحة، وأن يكتسب القدرة على استعمال اللغة استعمالاً صحيحاً في الاتّصال مع الآخرين؛ كالسرعة وجودة الإلقاء وحسن التعبير، وتعويده حسن الاستماع لما يسمع مما ييسّر له أموره ويعينه على قضاء حوائجه. تنمية الذوق الأدبي لدى الطالب حتى يدرك النواحي الجمالية في أساليب الكلام ومعانيه وصوره. تعويد الطالب التعبيرات السليمة الواضحة عن أفكاره وما يقع تحت حواسه نطقاً وكتابة وحسن استخدام علامات الترقيم. تنمية قدرة ومهارة الطالب الإملائية والخطية بحيث يستطيع الكتابة الصحيحة من جميع النواحي. إيقاظ وعي الطالب لإدراك شرف الكلمة وتوجيهه؛ للمحافظة على طهارتها ونقائها حتى لا تستعمل إلا في الخير. مساعدة الطالب على فهم التراكيب المعقدة والأساليب الغامضة .
Contents of the Course Unit:	**ملخص المحتويات :** تتلخص المحتويات على مواضيع تمنع الطالب من الوقوع في الاخطاء فضلا عن الكتابة بلغة سليمة.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students will be able to dealing with:
1	مقدمة عن الأخطاء اللغوية
2	التاء المربوطة والتاء المفتوحة
3	همزة الوصل والقطع
4	الهمزة المتوسطة والمتطرفة
5	قواعد كتابة الالف الممدودة والمقصورة
6	الحروف الشمسية والقمرية
7	الضاد والظاء
8	العـدد
9	المفاعيل
10	أقسام الكلام
11	معاني حروف الجر
12	تطبيقات الأخطاء اللغوية الشائعة
13	النون والتنوين
14	مقدمة عن الأخطاء اللغوية
15	الامتحان النهائي

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	NTU103		ARABIC LANGUAGE
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**2**	**30**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	NA	NA	NA
Reading	10	1	10
Assignment (Homework)	NA	NA	NA
Project Work	NA	NA	NA
Seminar	**1**	**1**	**1**
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	1	1	1
Final Exam	1	3	3
Preparation for the Final Exam	1	3	3
Mid-Term Exam	1		
Preparation for the Mid-Term Exam	1	1	1
Short Exam (Quizzes)	1		
Preparation for the Short Exam	1	1	1
TOTAL WORKLOAD OF THE COURSE UNIT	**33**	**13**	**50**
Workload (h) / 25			**50÷25**
ECTS Credits allocated for the Course Unit			**2**

MICROPROCESSORS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE201-S1	**Microprocessors**	1	4	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmad F. Al-Allaf**
Instructor(s) of the Course Unit	**Dr. Ahmad F. Al-Allaf**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To familiarize students with architecture, programming, and hardware of microprocessor. The course includes studying the internal architecture of the 8086 processor and the interaction between its components. As well as studying the connection pins of the 8086 processor and the different signals carried by these pins and the basic interface circuits. In addition, the different processor instruction sets are studied.
Contents of the Course Unit:	1- introduction 2- 8085 and 8086 internal architectures and pins descriptions 3- Basic interface circuit 4- 8086 instruction sets

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Microprocessor:** Introduction and History of Microprocessors, Basic Block Diagram of a Microprocessor, Organization of Microprocessor Based System, Bus Organization, Processing Cycle of a Stored Program Computer.
2	**8085 Microprocessor:** Internal Architecture and Features of 8085 microprocessor, pin description.
3	**8086/8088 Microprocessor:** Internal Architecture and Features of 8086 Microprocessor, components of BIU and EU.
4	**8086 Microprocessor:** Pin descriptions and bus cycles.
5	**8086 Microprocessor:** Pin descriptions and bus cycles.
6	**8086 Microprocessor:** 8284 clock generator and 8288 bus controller circuits
7	**8086 Microprocessor:** Minimum and Maximum configurations, Memory and I/O organization.
8	**8086 programming and instruction sets** 8086 Addressing Modes, instruction groups
9	**8086 instruction sets:** Data Movement instructions
10	**8086 instruction sets:** Arithmetic and logical instructions
11	**8086 instruction sets:** Jump instructions
12	**8086 instruction sets:** String instructions
13	**8086 instruction sets:** Programming examples
14	**Different Microprocessor Architectures:** Register Based and Accumulator Based Architecture, RISC and CISC Architectures, Digital Signal Processors.
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to debugging program
2	**Lab 2:** 8086 instruction formats
3	**Lab 3:** 8086 addressing modes
4	**Lab 4:** Program examples of Data movement instructions
5	**Lab 5**: Program examples of Arithmetic instructions
6	**Lab 6**: Program examples of Arithmetic instructions (addition and subtraction)
7	**Lab 7**: Program examples of Arithmetic instructions (Multiplication and division)
8	**Lab 8:** Program examples of logical instructions
9	**Lab 9:** Program examples of shift and rotate instructions
10	**Lab 10:** Program examples of timing delay using counters
11	**Lab 11:** Program examples of JMPs instructions
12	**Lab 12:** Program examples of stack instructions
13	**Lab 13:** Program examples of strings instructions
14	**Lab 14:** Program examples of call and return instructions

Workload & ECTS Credits of The Course Unit :	**BCTE201-S1**	**Microprocessor**	
Workload For Learning & Teaching Activities			
Type of the Learning Activates	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	3	6
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	86	63	175
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

COMPUTER ARCHITECTURE Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE201-S2	**Computer Architecture**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmad F. Al-Allaf**
Instructor(s) of the Course Unit	**Dr. Ahmad F. Al-Allaf**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course introduces the principles of computer organization and the basic architecture concepts. The course emphasizes memory technolog, memory hierarchy, memory organization, memory interfacing and I/O systems. Also study the hardware and software interrupts and their applications.
Contents of the Course Unit:	1 – Basic computer organization 2 – Internal and external memories 3 – ROMs and RAMs 4 – Memory interface to the 8088/8086 microprocessor 5 – Memory interfacing to 32-bit microprocessor 5 – I/O system design and interfacing 6 – Software and hardware interrupts

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	• **Basic computer architecture:** Computer organization, Primary and secondary memories, Memory hierarchy, types of ROMs and RAMs
2	• **Primary memory architecture:** Internal structure and operation of ROMs, and RAMs
3	• **Memory address decoder:** Simple address decode, 2-4 and 3-8 address decoders. Use programmable logic devices (PLDs) to decode memory addresses.
4	• **Memory interfacing:** Interfacing ROM and SRAM to the 8088 microprocessor, Expanding memory in size and words.
5	• **Memory interfacing:** Interfacing ROM and SRAM to the 8086 microprocessor.
6	• **Memory interfacing:** Interfacing ROM and SRAM to the 32-bit microprocessor.
7	• **Memory interfacing:.** Memory interfacing Design examples
8	• **I/O system:** The I/O Instructions, Isolated and Memory-Mapped I/O, Basic Input and Output Interfaces
9	• **I/O system interfacing:** Interfacing simple devices (LEDs and switches) to the 8088/8086 microprocessor
10	• **I/O system interfacing:** Interfacing ADC and DAC to the 8088/8086 microprocessor,
11	• **I/O system interfacing** Interfacing Keyboard and 7-segment displays to the 8088/8086 microprocessor
12	• **Interrupts:** Basic Interrupt Processing, Interrupt Instructions, Interrupt Vector, Hardware Interrupts.
13	• **Interrupts:** Expanding the Interrupt Structure, Using the 74ALS244 to Expand Interrupts, Daisy-Chained Interrupt.
14	• **Interrupts:** Interrupt Examples, Real-Time Clock, Interrupt-Processed Keyboard
15	• **Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to **Proteus** simulator for digital systems
2	**Lab 2:** Introduction to Memory type and organization
3	**Lab 3:** Address decoders
4	**Lab 4:** SRAM interfacing
5	**Lab 5**: ROM interfacing
6	**Lab 6:** Expanding ROM and RAM
7	**Lab 7:** Interfacing LEDs and switches to the microprocessor
8	**Lab 8:** Interfacing Keyboard to the microprocessor
9	**Lab 9:** Interfacing 7-segment display to the microprocessor
10	**Lab 10:** Interfacing ADC to the microprocessor
11	**Lab 11:** Interfacing DAC to the microprocessor
12	**Lab 12:** Expanding the Interrupt Structure using the 74ALS244
13	**Lab 13:** Interrupt design example
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit :	**BCTE201-S2**	**Computer Architecture**	
Workload For Learning & Teaching Activities			
Type of the Learning Activates	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

ANALOG ELECTRONICS FUNDAMENTALS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE202-S1	**Analog Electronics Fundamentals**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Thabat F. Thabet**
Instructor(s) of the Course Unit	**Dr. Thabat F. Thabet**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To learn the basics of electronic devices. • Study the structure and the characteristics of electronic devices (diodes and transistors). • To learn the applications of diodes. • Study the principles of binary junction transistors (BJT).
Contents of the Course Unit:	1 – Introduction to electronics. 2 – Application of diodes 3 – Other types of diodes 4 – Transistors

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**1- Introduction to electronics.** Physics of material, atoms, electrons and energy bands, types of material (insulators, conductors, and semiconductors), N-type and P-type semiconductor.
2	**1- Introduction to electronics.** Diodes, forward bias, reverse bias, V-I characteristics.
3	**2- Application of diodes.** Half-wave rectifier, average value, r.m.s. value, capacitor filter, ripple voltage.
4	**2- Application of diodes.** Full-wave rectifier, average value, r.m.s. value, capacitor filter, ripple voltage.
5	**2- Application of diodes.** Diode limiters, output voltage signal.
6	**2- Application of diodes.** Clampers and Voltage Doubler.
7	**3- Other types of diodes.** Zener diodes, V-I characteristics
8	**3- Other types of diodes.** Voltage regulators using Zener diode (variable input voltage, and variable load).
9	**3- Other types of diodes.** Zener limiters
10	**3- Other types of diodes** Special purpose diodes, Varactor, Light Emitting diode LED, Photo diode, Schottky diode, Tunnel diodes.
11	**4- Transistors** Bipolar junction transistor BJT, current, voltages, and parameters, maximum ratings.
12	**4- Transistors** BJT biasing, cutoff, saturation, operating point.
13	**4- Transistors** Transistor bias circuits, base-bias, voltage divider
14	**4- Transistors** Transistor bias circuits, emitter-bias, collector-feedback..
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to the Electronic Laboratory
2	**Lab 2:** Diode characteristics
3	**Lab 3**: Half-wave rectifiers
4	**Lab 4:** Full-wave rectifiers
5	**Lab 5:** Filter for Half-wave rectifiers
6	**Lab 6:** Filter for Full-wave rectifiers
7	**Lab 7:** Clipping Circuits
8	**Lab 8:** Clamper and Voltage Doubler
9	**Lab 9:** Zener diode characteristics
10	**Lab 10:** Voltage regulators using Zener diode
11	**Lab 11:** Transistor Characteristics
12	**Lab 12:** Transistor Biasing (part 1)
13	**Lab 13:** Transistor Biasing (part 2)
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit :	BCTE202-S1 Analog Electronics Fundamentals		
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
Total Workload of the Course Unit	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

ELECTRONIC CIRCUITS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE202-S2	**Electronic Circuits**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Thabat F. Thabet**
Instructor(s) of the Course Unit	**Dr. Thabat F. Thabet**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To learn the applications of BJT . • Study the types of BJT amplifiers (Common Emitter, Common Collector, and Common Base). • Study the Frequency response of amplifiers. • Differential and Operational Amplifiers • Study the family of Field Effect Transistors (FET).
Contents of the Course Unit:	1 – BJT Applications. 2 – BJT Amplifiers 3 – Frequency Response 4 – Differential and Operational Amplifiers 5 – Field Effect Transistors (FET).

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**1- <u>BJT Applications</u>.** BJT as a Switch (cutoff and saturation).
2	**1- <u>BJT Applications</u>.** Linear operation and DC load line.
3	**2- <u>BJT Amplifiers</u>.** Common Emitter CE.
4	**2- <u>BJT Amplifiers</u>.** Common Collector CC.
5	**2- <u>BJT Amplifiers</u>.** Common Base CB.
6	**3- <u>Frequency Response</u>.** The Decibel.
7	**3- <u>Frequency Response</u>.** Low Frequency Amplifier Response (Effect of the external capacitors)
8	**3- <u>Frequency Response</u>.** High Frequency Amplifier Response (Effect of the internal capacitors)
9	**3- <u>Frequency Response</u>.** Total Frequency Response (Bode Plot)
10	**4- <u>Differential and Operational Amplifiers</u>** Differential and Operational Amplifiers.
11	**4- <u>Differential and Operational Amplifiers</u>** Negative Feed-back (Inverting and Non-inverting Amplifiers).
12	**4- <u>Differential and Operational Amplifiers</u>** Applications of Operational Amplifiers.
13	**5- <u>Field Effect Transistors (FET).</u>** Junction Field Effect Transistors (JFET).
14	**5- <u>Field Effect Transistors (FET).</u>** Metal Oxide Semiconductor Field Effect Transistors (MOSFET).
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Review of Transistor Biasing (operating point)
2	**Lab 2:** BJT as a Switch (cutoff and saturation).
3	**Lab 3**: Linear operation and DC load line.
4	**Lab 4:** Common Emitter Amplifiers
5	**Lab 5:** Common Collector Amplifiers
6	**Lab 6:** Common Base Amplifiers
7	**Lab 7:** Frequency response of OPAMP
8	**Lab 8:** Inverting and Non-inverting OPAMPs
9	**Lab 9:** Analogue Comparator
10	**Lab 10:** The Integrator Circuit
11	**Lab 11:** The Differentiator Circuit
12	**Lab 12:** FET
13	**Lab 13:** FET Amplifier
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCTE202-S2**	**ELECTRONIC CIRCUITS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	3	2	6
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	5	1	5
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	1	5	5
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**71**	**64**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

OBJECT ORIENTED PROGRAMMING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE203-S1	**Object Oriented Programming**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Anmar Burhan Mohammed Salih**
Instructor(s) of the Course Unit	**Dr. Anmar Burhan Mohammed Salih**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To provide students with hands-on experience and practical skills to understand the theoretical parts of Introduction to C++ and OOP Basics.
Contents of the Course Unit:	1- Introduction to Object-Oriented Programming (OOP) 2- C++ Syntax and Basics 3- Classes and Objects 4- Inheritance and Polymorphism 5- Encapsulation and Data Hiding 6- Operator Overloading: 7- Templates 8- Exception Handling: 9- Advanced OOP Concepts

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to C++ and OOP Basics • Introduction to C++ programming language • Basic syntax, variables, and data types • Functions and control structures • Introduction to object-oriented programming (OOP) concepts: classes, objects, and methods
2	Classes and Objects • Defining and declaring classes • Creating objects and using constructors • Encapsulation and access modifiers (public, private, protected) • Member functions and data members
3	Inheritance and Polymorphism • Inheritance hierarchy and base/derived classes • Single inheritance and multiple inheritance • Polymorphism and function overriding • Abstract classes and pure virtual functions asses
4	Dynamic Memory Allocation and Pointers • Dynamic memory allocation with new and delete • Introduction to pointers and references • Memory management and deallocation • Object lifetime and scope
5	Operator Overloading • Overloading unary and binary operators • Overloading comparison and assignment operators • Friend functions and operator overloading • Best practices and guidelines for operator overloading
6	Templates and Generic Programming • Introduction to templates and generic programming • Function templates and class templates • Template specialization • Standard Template Library (STL) containers and algorithms

7	Exception Handling • Introduction to exception handling • try-catch blocks and handling exceptions • Throwing and catching exceptions • Exception specifications and best practices
8	• Midterm exam
9	File Handling and Streams • Input/output streams and file handling • Reading from and writing to files • Error handling and file status flags • Working with text and binary files
10	Advanced OOP Concepts • Polymorphism and virtual functions • Virtual base classes and diamond problem • Type casting and runtime type identification (RTTI) • Object slicing and dynamic casting
11	Standard Library Algorithms • Overview of the standard library algorithms • Sorting and searching algorithms • Numeric algorithms and iterators • Practical applications and usage examples
12	Memory Management • Smart pointers: unique_ptr, shared_ptr, weak_ptr • Memory management strategies and pitfalls • Resource Acquisition Is Initialization (RAII) • Memory leaks and debugging techniques
13	Namespaces and Organizing Code • Using namespaces for code organization • Creating and managing namespaces • Namespace conflicts and resolutions • Best practices for code modularization
14	Namespaces and Organizing Code • Using namespaces for code organization • Creating and managing namespaces • Namespace conflicts and resolutions • Best practices for code modularization
15	Final Exam

No.	PRACTICAL PART
1	**Lab 1:** Introduction to C++ • Basic syntax, variables, and data types•Functions and control structures
2	**Lab 2:** Classes and Objects • classes, objects, and methods document analysis
3	**Lab 3:** •Encapsulation and access modifiers (public, private, protected)•Member functions and data member
4	**Lab 4:** •Introduction to templates and generic programming •Function templates and class templates
5	**Lab 5:**•Template specialization •Standard Template Library (STL) containers and algorithms
6	**Lab 6:** •Introduction to exception handling • try-catch blocks and handling exceptions
7	**Lab 7:** •Introduction to exception handling • try-catch blocks and handling exceptions
8	**Lab 8:** Midterm
9	**Lab 9:** •OLID principles: Single Responsibility, Open-Closed, Liskov Substitution, Interface Segregation, Dependency Inversion
10	**Lab 10**: Design patterns: overview and examples
11	**Lab 11**: •Multithreading and concurrency in C++
12	**Lab 12**: **Assignment**
13	**Lab 13**: Applying design principles to real-world scenarios •Code refactoring and improvement
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE203-S1	OBJECT ORIENTED PROGRAMMING	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

COMPUTER APPLICATIONS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE203-S2	**Computer Applications**	2	3	2	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Shaima Miqdad Mohamed Najeeb**
Instructor(s) of the Course Unit	**Shaima Miqdad Mohamed Najeeb**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The main objective of this course is to provide a foundation in programming for engineering problem solving using the MATLAB software package. Students will develop the skills analyze and break down a program and solve it . Learn the capabilities and applications supported by the MATLAB program, implement them, and use them to solve various problems.
Contents of the Course Unit:	1- General introduction to matlab programming 2- An introduction to the MATLAB programming environment 3- Programming in MATLAB 4- Function in matlab. 5- Plotting in matlab 6- Matlab simulink 7- MATLAB GUI.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**General introduction to matlab programming:** Basic of programming in general and programming MATLAB® in particular Environment and Settings, Preferences and settings, platform differences, adding hardware and optional features
2	**Programming in MATLAB:** Introduction to matrices and vectors , creating a Matlab Matrix, referencing the Elements of a Matrix, deleting a Row or a Column in a Matrix.
3	**Programming in MATLAB:** Arithmetic ,logical and bitwise operations.
4	**Programming in MATLAB:** Writing MATLAB scripts and functions, a custom-made Matlab functions.
5	**Programming in MATLAB** : Loops and control flow (for-loops, if-statements)
6	**Function in MATLAB** : Declare function name, inputs, and outputs(syntax) with examples.
7	**Plotting in matlab:** Overview of MATLAB Plotting, Plotting Process graph components,figure tools,selecting plot types
8	**Plotting in matlab:** Basic Plotting (Multiple Data Sets in One Graph, Specifying Line Styles and Colors, Multiple Plots in One Figure, Setting Axis Limits).
9	**Plotting in matlab:** Mesh and surface plots, visualizing functions of two variables .
10	**Plotting in matlab:** Handle graphics: Work with graphics objects and set object properties. Animations: Create moving graphics
11	**Matlab simulink:** Simulink Concepts, simulink environment,basic elements,simulink librarys
12	**Matlab simulink:** Block Libraries,modifying the blocks ,interactive model editing,programmatic model editing and running simulation .
13	**MATLAB GUI:** Creating Graphical User Interfaces, introduces GUIDE, the MATLAB graphical user interface design environment, Laying out a GUI,
14	**3D Computer Graphics Operations:** Programming a GUI, introduces callbacks to define behavior of the GUI components, Menu-driven programs, Controls: uimenu and uicontrol.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to MATLAB .
2	**Lab 2:** Basic commands
3	**Lab 3**: Working with matrices part(I)
4	**Lab 4:** Working with matrices part(II)
5	**Lab 5:** Relational ,logical bitwise operations
6	**Lab 6:** Input and output commands in a script file.
7	**Lab 7:** Flow control(if and switch-case) statements
8	**Lab 8:** Loop(for,while,break,continue)statements
9	**Lab 9:** M-file functions
10	**Lab 10:** 2D Plotting functions
11	**Lab 11:** 3D Plotting functions
12	**Lab 12:** Basics of Matlab simulink
13	**Lab 13:**Graphical user interface part(I)
14	**Lab 14:** Graphical user interface part(II)

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCTE203-S2**	**COMPUTER APPLICATIONS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	1	14
Preliminary & Further Study	3	1	3
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	5	2	10
Project Work	1	1	1
Seminar	1	2	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	5	5
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	0.5	2
TOTAL WORKLOAD OF THE COURSE UNIT	**61**	**35**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

APPLIED MATHEMATICS Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE204-S2	**Applied Mathematics**	1	3	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Ayhan Ahmed Khaleel**
Instructor(s) of the Course Unit	**Ayhan Ahmed Khaleel**

OBJECTIVES AND CONTENTS	Introduce students to mathematics through the laws and issues necessary for the purpose of assisting them in their studies in their field of specialization .
Objectives of the Course Unit:	To learn the
Contents of the Course Unit:	1- Matrices and systems of equations 2- Differential equations 3- Infinite Series

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Review of matrices and their properties
2	Complex matrices, Hermitian, skew-Hermitian and unitary matrices
3	Inverse matrices and elementary row operation
4	Gaussian and Gauss-Jordan elimination.
5	rank of a matrix
6	Eigen values and Eigenvectors.
7	First order differential equations, variable separable, homogeneous
8	linear first order and exact differential equations
9	Non-homogeneous second order with constant coefficients
10	Convergence and the Divergence tests-part1
11	Convergence and the Divergence tests-part2
12	Alternating series ,Absolute and conditional convergence
13	Power series
14	Taylor and Maclaurin series
15	**Final Exam**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE204-S1	APPLIED MATHEMATICS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**3**	**45**
Tutorial	**13**	**1**	**13**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	NA	NA	NA
Reading	NA	NA	NA
Assignment (Homework)	4	1	4
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	NA	NA	NA
Final Exam	1	3	3
Preparation for the Final Exam	1	15	15
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	8	8
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	2	8
TOTAL WORKLOAD OF THE COURSE UNIT	**44**	**34.5**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

COMMUNICATION FUNDAMENTALS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE204-S2	**Communication Fundamentals**	1	4	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Emad A. Mohammed**
Instructor(s) of the Course Unit	**Dr. Emad A. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To learn the fundamentals of communication system and the main structure of the system including transmitters, receivers and channels. • To learn the basic techniques used in signal representation, modulation and demodulation
Contents of the Course Unit:	1 – Introduction to signals and systems 2 – Signal representation in frequency domain 3 – Modulation techniques 4 – Transmission channels

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Signals and system definition, periodic signals, non-periodic signal, deterministic and non-deterministic signals
2	Linear systems and nonlinear systems, filters
3	Fourier series, signal harmonics
4	Fourier transform, Frequency domain, exponential and trigonometric Fourier transform
5	Properties of Fourier Transform, application of Fourier transform
6	Baseband signal transmission, line coding, polar code, bipolar code, Manchester code
7	Analogue modulation Techniques, AM, FM, PM
8	Pulse modulation techniques, PAM, PPM, PWM
9	Digital modulation Techniques ASK, PSK, FSK
10	Multilevel modulation, QAM
11	Wireless channels, Shannon equation, channel capacity
12	Transmission lines and their equivalent circuits, TL characteristics
13	Incident wave, reflected wave
14	Smith Chart, matching techniques
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Signals properties
2	**Lab 2:** Linear systems and nonlinear systems, filters
3	**Lab 3**: Harmonics determination
4	**Lab 4:** Fourier transform, Spectrum analysis
5	**Lab 5:** Fourier transform properties
6	**Lab 6:** Types of Baseband signals
7	**Lab 7:** Amplitude and phase modulation
8	**Lab 8:** Frequency modulation
9	**Lab 9:** PPM, PAM, PWM
10	**Lab 10:** ASK
11	**Lab 11:** FSK
12	**Lab 12:** PSK
13	**Lab 13:** QAM
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE2041-S2 COMMUNICATION FUNDAMENTALS		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	2	4
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	14
TOTAL WORKLOAD OF THE COURSE UNIT	**86**	**62**	**175**
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

DATA STRUCTURES Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE205-S1	**Data Structures**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Mohand L. Ahmed**
Instructor(s) of the Course Unit	**Dr.Mohand L. Ahmed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Provide the knowledge of basic data structures and their implementations, understand importance of data structures in context of writing efficient programs and develop skills to apply appropriate data structures in problem solving.
Contents of the Course Unit:	1- Introduction to the data structures and course objectives 2- Linear data structures 3- Algorithm Analysis. 4- Recursive and back tracking technique 5- Link list 6- Tree 7- Sorting algorithm

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**General introduction to data structures:** Introduce to the Basic types of Data Structures and the common algorithm
2	**Linear data structures:** What is linear data structure, characteristics of linear data structure and types of linear data structure.
3	**Algorithm Analysis:** Algorithm Analysis types and methods,experimental of analysis algorithm
4	**Recursion:** Introduction to recursion, some problems that solved by recursion and the difference between recursion and iteration
5	**Back tracking technique**: Introduction to back tracking technique ,general method of back tracking technique ,when to use a Backtracking algorithm and How does Backtracking work.
6	**Linked Lists**: Introduction linked lists data structures ,comparison between linked lists and array .
7	**Linked Lists**: basic operations on linked lists(Insertion, Deletion and traversing).
8	**Types of linked lists:** Doubly linked lists,circular linked lists,memory -efficient doubly linked list,unrolled linked lists
9	**Stacks:** What is a Stack,how stacks are used and stack applications and implementations.
10	**Queue:** What is queue ,how are queues used and queue exceptions and implementations
11	**Tree :** What is tree,binary trees and types of binary trees and properties of binary trees.
12	**Tree:** Binary tree traverals,generic trees(N-ary trees) and threaded binary tree traversals.
13	**Sorting algorith:** What is sorting ,why is sorting necessary and classification of sorting algorithms.
14	**Sorting algorith:** Classification of sorting algorithm types:bubble sort, selection sort, insertion sort,shell sort,merge sort ,quick sort and tree sort.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** function declaration and function expression
2	**Lab 2:** pointer declaration and initialization.
3	**Lab 3**:user defined data structures
4	**Lab 4**: Implementation problems using iteration/recursion problems
5	**Lab 5**: implementation of back tracking method
6	**Lab 6:**how to define a linked list node and programming traversal operation.
7	**Lab 7:**programming a linked list insertion operation.
8	**Lab 8:** programming a linked list deletion operation.
9	**Lab 9:** Implementation of push and pop operation on stack
10	**Lab 10:** Programming some application using stack.
11	**Lab11:** Programming the queue to store some of data
12	**Lab 12:** Programming a storing data as tree structure and implementation of various traversal techniques
13	**Lab 13:** Programming a storing data as graph structure and implementation of various traversal technique
14	**Lab 14:** Programming a bubble sort, selection sort and insertion sort algorithms
15	**Lab 15:** Programming a shell sort,merge sort ,quick sort and tree sort algorithms

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE205-S1	DATA STRUCTURES	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**2**	**30**
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**2**	**28**
Reading	NA	NA	NA
Assignment (Homework)	6	2	12
Project Work	1	2	2
Seminar	1	1	1
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	4	2	8
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	5		
Preparation for the Short Exam	5	1	5
TOTAL WORKLOAD OF THE COURSE UNIT	**62**	**41**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

WEBSITE DESIGN Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE205-S2	**Website Design**	2	3	2	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Nawar Ali Ibrahim Al_Obaidy**
Instructor(s) of the Course Unit	**Nawar Ali Ibrahim Al_Obaidy**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The main objective of this course is to help students to create professional websites of all kinds with the help of modern systems and programs and experience in the field of websites. In addition to obtaining skills that enable them to fill a job efficiently in the same field and provide funds for their institutions, as well as the possibility of entering the world of e-commerce without programming and complexity and in a short time.
Contents of the Course Unit:	1- Introduction to Website Building. 2- The Website and Its Future. 3- The Language of the Web: HTML5. 4- Structuring the content of a web page. 5- Style Sheets: CSS3. 6- Design and Creation a Website.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Background and Phases of Evolution of the Web.
2	Web application architecture.
3	Choosing a Domain Name and Hosting
4	Installing WordPress and Account Setup
5	WordPress Admin Dashboard and the Features
6	Structure of an HTML5 document.
7	CSS3 Overview.
8	Process of creating a website.
9	Different website types and ergonomics the website
10	New Theme Installation
11	Header and Landing Page Top Design
12	How to Insert Logo, Site Title, and Setup Search Box on a Website
13	Explanation of Post Screen Option and its Use
14	Footer Design of a Website and Adding Social Media Link
15	Final Exam.

No.	PRACTICAL PART
1	**Lab 1:** Step-by-Step Guide to Registering Domain Name.
2	**Lab 2:** Structure of an HTML5 web page.
3	**Lab 3**: How to Design the Menu Items.
4	**Lab 4:** Simple Forms and Table Formatting.
5	**Lab 5:** How to Add Search on the Website.
6	**Lab 6:** How to Change Website Title and Description
7	**Lab 7:** Steps in Adding Gallery to a Website using Gallery Widget Option.
8	**Lab 8:** How to Place Slider on the Website.
9	**Lab 9:** How to Publish with Post Tool.
10	**Lab 10:** How to insert Page Break (Block) in a Post.
11	**Lab 11:** How to Hyperlink in a Post.
12	**Lab 12:** Inserting Image/Photo in the Post or Pages.
13	**Lab 13:** Creating a template model.
14	**Lab 14:** Creating a website from A to Z.

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT:	BCTE205-S2	WEBSITE DESIGN	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES(# OF WEEK)	DURATION(HOURS,H)	WORKLOAD(H)
Lecture & In-Class Activities	**51**	**1**	**15**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**2**	**28**
Reading	NA	NA	NA
Assignment (Homework)	2	2	4
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	5	5
Mid-Term Exam	1	2	2
Preparation for the Mid-TermExam	1	2	2
Short Exam (Quizzes)	2	1	
Preparation for the Short Exam	2	1	
TOTAL WORKLOAD OF THE COURSE UNIT	**44**	**16**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

MEASUREMENTS & SENSORS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE206-S1	**Measurements & Sensors**	1	3	3	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Ahmed Waled Kasim**
Instructor(s) of the Course Unit	**Ahmed Waled Kasim**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• Explain the basic working principle of various electronic measurement instruments used to measure electrical parameters like current, voltage, power etc. • Understand and describe the specifications, features, characteristics, error and the performance of an instrument. • Learn about various types AC bridges and their applications in measurements of capacitance, frequency, inductance etc. • Gain knowledge about the functional blocks of a CRO and do analysis, measurements of waveform display. • Explain working of various types of sensors, transducers and their applications.
Contents of the Course Unit:	• Definition of Measurements and Errors. As well as the types of errors. • Identify and design the Electromechanical Indicting Instruments both types DC and AC. • Studying the DC and AC Bridges as well as their Applications. • Introduction to Oscilloscopes. • Hall Effect Theory and its applications. • Introduction to Signal Generation. • Analogue and Digital Data Acquisition System. • Computer – Controlled Test System.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Measurement and Errors.**
2	**Electromechanical Indicting Instruments.**
3	**Electromechanical Indicting Instruments.**
4	**Electromechanical Indicting Instruments.**
5	**Bridges and their Applications.**
6	**Bridges and their Applications.**
7	**Oscilloscopes.**
8	**1- Theory of Hall Effect, Hall Effect Sensors, Basic Hall Effect Sensors.** **2- Analogue output Sensors.**
9	**Mid-Term Exam.**
10	**1- Digital output Sensors.** **2- Some Examples about Hall Effect Sensors.**
11	**Signal Generation.**
12	**Analogue and Digital Data Acquisition System.**
13	**Computer – Controlled Test System.**
14	**Preparatory Week.**
15	**Final Exam.**

No.	PRACTICAL PART
1	Lab1: Measurements of DC current.
2	Lab2: Measurements of DC voltage.
3	Lab 3: Loading effect on Voltmeter.
4	Lab 4: Series type Ohmmeter.
5	Lab 5: AC Voltmeter using half wave rectifier.
6	Lab 6: AC Voltmeter using full wave rectifier.
7	Lab 7: DC Bridges (Wheatstone bridge).
8	Lab 8: Comparison bridges.
9	Lab 9: Maxwell and Hay bridges.
10	Lab 10: Measurements of frequency.
11	Lab 11: Measurements of phase angle using Lissajous method.
12	Lab 12: Calibration of Thermocouple.
13	Lab 13: Photosensitive.
14	Lab 14: Review.

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE206-S1 MEASUREMENTS & SENSORS		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	**15**	**1**	**15**
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	**14**	**1**	**14**
Reading	NA	NA	NA
Assignment (Homework)	3	1	3
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	NA	NA	NA
Final Exam	**1**	**3**	**3**
Preparation for the Final Exam	1	8	8
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	4		
Preparation for the Short Exam	4	1	1
TOTAL WORKLOAD OF THE COURSE UNIT	**34**	**21**	**50**
Workload (h) / 25			**50÷25**
ECTS Credits allocated for the Course Unit			**2**

SUMMER TRAINING 1 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCTE206-S2	**Summer Training 1**	2	2	1	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Basma MohammedKamal Younis**
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	1- القدرة على ربط المعرفة المكتسبة من الطالب خلال دراسته االاكاديمية بالمشاكل الحقيقة على ارض الواقع 2- اكتشاف بيئة العمل واحتياجاتها وقيودها 3- القدرة على تحديد المتطلبات المطلوبة لايجاد حلول مناسبة وفعالة للمشاكل الحقيقية على ارض الواقع مع وجود قيود فنية مختلفة 4- القدرة على تكوين رؤية واضحة حول الاهداف والمعوقات والعمل بشكل فعال 5- ايجاد الطالب استقالاليته باكتسابه لمهارات جديدة مع اشراف بسيط من قبل جهة التدريب . 6- القدرة على ايجاد حلول مناسبة في حال حدوث اي تغيير في متطلبات العمل وقيوده 7- القدرة على التواصل مع الكثير من االشخاص المتواجدين في المجال العملي . 8- تعلم المسؤوليات الاخلاقية والاحترافية.
Contents of the Course Unit:	- تشغيل وصيانة الحاسبات - بعض البرامج المستخدمة في صيانة الحاسوب - التعرف على الاعطال الشائعة في الحاسبات

WEEK	KEY LEARNING OUTCOMES OF THE COURSE UNIT : PRACTICAL PART
1	- تعريف الطالب على اقسام وشعب الموقع التدريبي مع اعطاء نبذة مختصرة عن اجزاء الحاسبة وكيفية عملها وامكانية صيانة بعض اجزائها.
2	- التعرف على اجزاء القرص الصلب وكيفية تقسيمه وطريقة خزن البيانات ومقارنته مع قرص SSDو M2 والطرق المستخدمة لتصفير القرص (NTFS,FAT16,FAT32)
3	- التعرف الاعطال الشائعة في الاقراص الصلبة وكيفية معالجتها والبرامج المستخدمة في عملية اصلاح الاقراص الصلبة واسترجاع المعلومات المحذوفة او المفقودة بعد عملية الاصلاح
4	- اعطاء نبذة مختصرة عن انواع الطابعات الالكترونية والاعطال التي تواجه هذه الطابعات وكيفية معالجتها. - التعرف على طبيعة الاجهزة المسيطر عليها حاسوبياً وكيفية عملها في حال توفرها في الموقع التدريبي
5	**Final Exam**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCTE206-S2	SUMMER TRAINING 1	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVATES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	4	5	20
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	NA	NA	NA
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	4	2	8
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	1	1
Preparation for the Final Exam	1	2	2
Mid-Term Exam	NA	NA	NA
Preparation for the Mid-Term Exam	NA	NA	NA
Short Exam (Quizzes)	NA	NA	NA
Preparation for the Short Exam	NA	NA	NA
TOTAL WORKLOAD OF THE COURSE UNIT	27	15	50
Workload (h) / 25			**50÷25**
ECTS Credits allocated for the Course Unit			**2**

CONTROL ENGINEERING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE301-S1	**Control Engineering**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Ziad Saeed Mohammed**
Instructor(s) of the Course Unit	**Dr.Ziad Saeed Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	It is considered to be familiar with the components of the control circuits, the types of controllers, their uses and their applied circuits. Learn about automatic control systems, their analysis and representation methods for checking the stability, and their practical applications in engineering fields.
Contents of the Course Unit:	1- Definition of a control system, and type classifications. 2- Modelling of a control system, and Transfer Function with block diagrams representation. 3- Control system stability and methods, system performance (with steady state error calculations). 4. Time and Transient response specifications. 5- root locus method Analysis. 6-Frequency response analysis, (Bode Plots). 7- Compensations with design the active types of controllers.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to linear control system, open and closed loop system.
2	Mathematical modeling of physical systems and transfer functions,
3	Mathematical modeling of D.C. Servo Motor. State space representation and analysis.
4	Transfer function, block diagram representation and reduction diagram.
5	Transfer function, block diagram representation and reduction diagram.
6	Time domain analysis, steady–state transient analysis. Part-1
7	Time domain analysis, steady–state transient analysis. Part-2
8	Stability analysis and Routh stability criteria.
9	Root Locus Technique. Part-1
10	Root Locus Technique. Part-2
11	Frequency Response analysis, phase, gain margin and bode plots. Part-1
12	Frequency Response analysis, phase, gain margin and bode plots. Part-2
13	Compensation, phase–lag compensation lag–lead compensation.
14	P, PI, PD, and PID Modes of Feedback Control, Realization of PID Controller Using Active and Passive Elements.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab1:** ExplanationofCKL003 Board+ D.C. motor speed control.
2	**Lab2:**The linear operational amplifier as computational element.
3	**Lab 3:** Dimmer light control+ Temperature control.
4	**Lab 4:** Three steps control.
5	**Lab 5:** Alternating current control motors using (ON-OFF) switching.
6	**Lab 6:** Control on operation of two motors in sequences+ Liquid level control system.
7	**Lab 7:** Transfer function part1+ Transfer function part2
8	**Lab 8:** Response of second order system.
9	**Lab 9**: Frequency response (Bode plots).
10	**Lab 10:** Frequency response (polar plots and Nyquist plots).
11	**Lab 11:** Speed control and error correction for C-L using PD controller.
12	**Lab 12**: Proportional-integral controller.
13	**Lab 13**: Proportional plus integral plus derivative controller or PID.
14	**Lab 14:** The Control Function of Time Delay Valve 3/2 Way. (NORMALY CLOSED)

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE301-S1 CONTROL ENGINEERING		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

MICROPROCESSOR SUPPORTED CHIPS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE302-S1	**Microprocessor Supported Chips**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Abdullah Mohammed A. Hamdoon**
Instructor(s) of the Course Unit	**Abdullah Mohammed A. Hamdoon**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The lectures are focus on the design and implementation of microprocessor-based systems. This includes discussing the different components that suport microproceesor to interface external peripherals devices by supported chips. Students learn about the bus architecture, interrupt handling, Direct Memory Access, Serial input/output, analog input/output and I/O techniques. All the above Knowlsdge enable students to read the data sheet of any devices and understand how it work and connecting with microprocessor.
Contents of the Course Unit:	1- Design hardware interface circuit with microproccer. 2- Connecting input/output device with PPI chip. 3- Generate differences clocks, rate generate pulses, and events counting for peripherals devices. 4- Using interrupt to input/ output data. 5- Input / output serial data. 6- Input / output analog data.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Microprocessor interfacing Circuit Design
2	8255 Programmable Peripheral Interface (PPI) I
3	8255 Programmable Peripheral Interface (PPI) II
4	8254 Programmable Interval Timer (PIT) I
5	8254 Programmable Interval Timer (PIT) II
6	Microprocessor Interrupts
7	8259A Programmable Interrupt Controller(PIC) I
8	8259a Programmable Interrupt Controller(PIC) II
9	8237 Programming Direct Memory Access (DMA) Controller I
10	8237 Programming Direct Memory Access (DMA) Controller II
11	16550 Programmable Communication Interface
12	16550 Programmable Communication Interface Applications
13	Analog-to-Digital Conversion Application ADC0804
14	Digital-to-Analog Conversion Application DAC0808
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Training on Proteus Program to Make Processor work
2	**Lab 2:** Microprocessor interfacing Circuit Design in Protues (Leds and Switches)
3	**Lab 3:** Microprocessor interfacing Circuit Design in Protues (Seven Segment Display (SSD))
4	**Lab 4:** Programmable Peripheral Interface (Keypad and SSD)
5	**Lab 5:** Programmable Peripheral Interface (Application)
6	**Lab 6:** Programmable Interval Timer
7	**Lab 7:** Programmable Interval Timer (Application)
8	**Lab 8:** Microprocessor Interrupts Design
9	**Lab 9:** Programmable Interrupt Controller
10	**Lab 10**: Programmable Communication Interface
11	**Lab 11**: Programmable Communication Interface Application
12	**Lab 12**: Analog-to-Digital Conversion Application (ADC0804)
13	**Lab 13**: Digital-to-Analog Conversion Application (DAC0808)
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE302-S1	MICROPROCESSOR SUPPORTED CHIPS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	1	2
Land Surveying	NA	NA	NA
Group Work	4	1	5
Laboratory	14	2	28
Reading lectures in home	14	2	28
Assignment (Homework)	5	1	5
Project Work	NA	NA	NA
Seminar	1	3	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	16	16
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	8	8
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	2	1.5	3
TOTAL WORKLOAD OF THE COURSE UNIT	**72**	**47**	**152**
Workload (h) / 25			**152÷25**
ECTS Credits allocated for the Course Unit			**6**

DIGITAL SIGNAL PROCESSING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE303-S1	**Digital Signal Processing**	1	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Mohand L. Ahmed**
Instructor(s) of the Course Unit	**Dr.Mohand L. Ahmed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Provide background and fundamental material for the analysis and processing of digital signals and to familiarize the relationships between continuous-time and discrete-time signals and systems. study fundamentals of time, frequency and z-plane analysis and to discuss the inter-relationships of these analytic method and to study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications. Implement discrete time systems, recursive and nonrecursive realizations.
Contents of the Course Unit:	DSP basic concepts such as sampling, reconstruction and aliasing Discrete-Time Signal Processing fundamentals of time, frequency and z-plane analysis Filter Design — Continuous and Discrete Fundamental filtering algorithms such as FIR, IIR, FFT.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Digital Signal Processing(DSP) system:** What DSP,general block diagram,classification and its properties.
2	**A/D and D/A conversion :** Understand how digital to analog (D/A) and analog to digital (A/D) converters operate on a signal and be able to model these operations mathematically
3	**Discrete-Time Signal processing:** Define simple non-periodic discrete-time sequences such as the impulse and unit step, and perform time shifting and time-reversal operations on such sequences
4	**Discrete-Time Signal Transformations:** Time –Reversal ,Time – Scaling and Time –Shifting
5	**Discrete-Time Signal Amplitude Transformation:** Amplitude – Reversal ,Amplitude – Scaling and Amplitude – Shifting
6	**Discrete –Time Systems :** Interconnected System ,Definition,Types of Interconnected Systems and their mathematical Models
7	**Properties of Discrete-Time Systems :** System with Memory,Causality and Time –Invariant System
8	**Properties of Discrete-Time Systems :** Inverse of Systems,Time Invariance,Stability and Linearity
9	**Discrete-Time Systems :** Given the difference equation of a discrete-time system to demonstrate linearity, time-invariance, causality and stability, and hence show whether or not a given system belongs to the important class of causal, LTI systems
10	**Discrete-Time system:** Given the impulse response of a causal LTI system, show whether or not the system is bounded-input/bounded-output (BIBO) stable.
11	**Convolution of Discrete-Time Systems:** Properties of Discrete-time systems with convolution .Convolution with impulse response and for definite discrete-time signals
12	**Time/Frequency Domain Representation of Signals:** Perform time, frequency and Z-transform analysis on signals**.**
13	**Discrete-Time Fourier Transform :** Define the Discrete Fourier Transform (DFT) and the inverse DFT (IDFT) of length N
14	**Digital Filters :** Introduction to finite impulse response (FIR) and infinite impulse response (IIR) filters ,the differnce between them and their characteristic. **Design filters:** . Design of infinite impulse response (IIR) filters and finite impulse response (FIR) filters for a given specification.
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Represent basic signals like:Unit Impulse, Ramp, Unit Step,Exponential.
2	**Lab 2:**. Generate discrete sine and cosine signals with given sampling frequency
3	**Lab3:**Ilustrate the Nyquist sampling theorem
4	**Lab 4**: Represent complex exponential as a function of real and imaginary part.
5	**Lab 5**: Determine impulse and step response of two vectors.
6	**Lab 6**: Perform convolution between two vectors .
7	**Lab7:** Determine rational z-transform from the given poles and zeros .
8	**Lab 8:** Compute DFT and IDFT of a given sequence .
9	**Lab 9:** Compute the DFT of a sequence x (n) using DIT and DIF algorithm.
10	**Lab 10:** Perform linear convolution of two sequence using DFT .
11	**Lab 11**: Design Band pass and Band reject FIR linear phase filter using Hamming and Hanning windows
12	**Lab 12:** Design a Type 1 Chebyshev IIR highpass filter.
13	**Lab 13:** Design an IIR Elliptic low pass filter.
14	**Lab14:** design an IIR Butterworth bandpass filter
15	**Lab 15:** To study coefficient quantization effects on the frequency response of acascade form IIR filter .

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCCTE303-S1**	**DIGITAL SIGNAL PROCESSING**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	1	2	2
Land Surveying	NA	NA	NA
Group Work	1	2	2
Laboratory	15	2	30
Reading	NA	NA	NA
Assignment (Homework)	4	2	8
Project Work	1	2	2
Seminar	1	1	1
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	2	2
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	3	2	6
Final Exam	1	3	3
Preparation for the Final Exam	1	4	4
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	0.5	2
TOTAL WORKLOAD OF THE COURSE UNIT	**54**	**31**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

ENGINEERING ANALYSIS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE304-S1	**Engineering Analysis**	1	4	3	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Orjuwan Mohammed Abduljawad Al-Jawadi**
Instructor(s) of the Course Unit	**Orjuwan Mohammed Abduljawad Al-Jawadi**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To help students to understand the engineering analysis transformations in complex frequencies domains, in order to solve complicated mathematical and electrical circuits.
Contents of the Course Unit:	1 – Laplace Transform 2 – Z-Transform 3 – Probability 3 – Numerical Computations 4 – Solution of non-Linear equations 5- Numerical solution of ordinary differential equation

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Continues Unit Step Function and Impulse Function Definition
2	Laplace transform, Properties, theorems and applications
3	Laplace Inverse Transform, Properties, theorems and applications
4	Z-transform, properties, theorems, and applications
5	Z- Inverse Transform, properties, theorems, and applications
6	Probability: Basic terminology, probability and set notation
7	Probability: law of probability, independent events
8	Statistics: Graphical representation, measure of central tendency
9	Statistics: measure of dispersion
10	Numerical computations: bisection method, false position method
11	Newton-Raphson method: solution of algebraic equations, Newton-Raphson method: transcendental equations
12	Solution of linear simultaneous equations: 1) Direct methods (Gauss elimination, Gauss Jordan) 2) Iterative method (Jacobi's, Gauss-seidel iteration)
13	Numerical solution of ordinary differential equation (Picard's , Euler's method)
14	Solution of nonlinear equation (Newton-Raphson method)
15	**Final Exam**

No.	Practical Part
1	**Lab 1:** Introduction to Unit Step Function and Impulse Function
2	**Lab 2:** Plotting and Control Flow in MATLAB
3	**Lab 3:** Laplace Transform Definition
4	**Lab 4:** Laplace Transform Properties
5	**Lab 5:** Inverse Laplace Transform
6	**Lab 6:** Inverse Laplace Transform by Partial Fractions
7	**Lab 7:** Solving Complex Electrical Circuits using Laplace Transform
8	**Lab 8:** Z-Transform
9	**Lab 9:** Z-Transform Properties
10	**Lab 10:** Inverse of Z-Transform
11	**Lab 11:** Solution of Special DE function using Simulink
12	**Lab 12:** System Stability using Z-Transform
13	**Lab 13:** Newton –Raphson Method
14	**Lab 14:** Taylor Series in MATLAB

Workload & ECTS Credits of The Course UNIT:	**BCCTE304-S1**	**Engineering Analysis**	
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	2	1	2
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	2	1	2
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	1	1	1
Final Exam	1	3	3
Preparation for the Final Exam	1	1	1
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	1	1
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	2	1.5	3
Total Workload of the Course Unit	**44**	**16**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

DIGITAL COMMUNICATION FUNDAMENTALS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE305-S1	**Digital Communication Fundamentals**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Hakam Marwan Zaidan**
Instructor(s) of the Course Unit	**Hakam Marwan Zaidan**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To introduce students to the fundamental concepts, principles, and techniques underlying digital communication systems. The course aims to provide a solid foundation in understanding various components of digital communication, including modulation techniques, channel coding, multiplexing, and error detection and correction. By the end of the course, students should be able to analyze and design digital communication systems, evaluate their performance in different channel conditions, and make informed decisions regarding the selection of appropriate modulation and coding schemes. The course also emphasizes the practical aspects of digital communication through hands-on experiments and simulations. Overall, the course aims to equip students with a comprehensive understanding of digital communication principles and the skills necessary for the design and implementation of efficient and reliable digital communication systems.
Contents of the Course Unit:	Introduction to digital communication, Modulation techniques, Introduction to coding, Multiple access techniques.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Digital Communication:** Overview of digital communication systems, Analog vs. digital communication, Elements of a digital communication system
2	**Signals and Systems:** Signal representation and manipulation, Fourier analysis and frequency domain representation Time and frequency domain characteristics of signals.
3	**Modulation Techniques:** Introduction to digital modulation techniques (ASK, FSK, PSK), Performance metrics: modulation index, bandwidth, power efficiency
4	**Pulse Amplitude Modulation (PAM):** Introduction to PAM and its applications, PAM waveform generation and detection, Performance analysis of PAM in the presence of noise.
5	**Pulse Code Modulation (PCM):** Sampling theorem and Nyquist criterion, Quantization and coding of PCM signals, Quantization noise and signal-to-noise ratio (SNR).
6	**Baseband Transmission:** Introduction to bandpass transmission, Analog and digital modulation schemes, Coherent and non-coherent detection techniques
7	**Baseband Transmission:** Introduction to bandpass transmission, Analog and digital modulation schemes, Coherent and non-coherent detection techniques
8	**Error Detection and Correction:** Introduction to error detection and correction codes, Parity check, Hamming codes, and cyclic redundancy check (CRC), Bit error rate (BER) and its calculation
9	**Channel Capacity and Coding:** Shannon's channel capacity theorem, Channel capacity limits for various communication channels, Channel coding techniques (Block codes, Convolutional codes)
10	**Multiple Access Techniques**
11	**Equalization and Diversity**
12	**Spread Spectrum Techniques**
13	**Wireless Communication Systems**
14	**Introduction to Digital Modulation**
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to MATLAB/Simulink
2	**Lab 2:** Signal Analysis and Fourier Transform
3	**Lab 3:** Digital Modulation Techniques
4	**Lab 4:** Pulse Amplitude Modulation (PAM)
5	**Lab 5:** Pulse Code Modulation (PCM)
6	**Lab 6:** Line Coding Techniques
7	**Lab 7:** Baseband Transmission
8	**Lab 8:** Analog and Digital Modulation
9	**Lab 9:** Error Detection and Correction
10	**Lab 10:** Channel Capacity and Coding
11	**Lab 11:** Multiple Access Techniques
12	**Lab 12:** Equalization and Diversity
13	**Lab 13:** Spread Spectrum Techniques
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit : BCCTE305-S1 Digital Communication Fundamentals			
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
Total Workload of the Course Unit	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

COMPUTER NETWORKS FUNDAMENTALS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE306-S1	**Computer Networks Fundamentals**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ziyad Khalaf Farej**
Instructor(s) of the Course Unit	**Dr. Ziyad Khalaf Farej**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	**The objectives of computer networks fundamentals are to provide students with a solid foundation in networking concepts, protocols, technologies, and practices, enabling them to understand, design, implement, and troubleshoot computer networks effectively.**
Contents of the Course Unit:	1- Introduction to data communication and networks 2- Network Models 3- LANs Topologies 4- Digital signals transmission 5- Multiplexing and Demultiplexing 6- Switching 7- Wired LANs

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to data communication and networks:** Data Representations, Data Flows, and classify the computer networks according to application, size, transmission technology
2	**Network Models:** Protocol Layering, The ISO reference Model, and TCP/IP Reference Model
3	Connection-Oriented Versus Connectionless Service, and Service Primitives
4	**LANs Topologies:** CSMA/CD, Token Access protocols, and IP addressing
5	Metropolitan Area Networks, Wide Area Networks, Internetworks, and VPNs
6	performance metrics, Bandwidth, Throughput, Latency (Delay),Bandwidth-Delay, Jitter
7	**Digital signals transmission:** impairment (attenuation, distortion, noise, data rate limits) Channel capacity and Shannon Formula
8	Bandwidth-Limited Signals, The Maximum Data Rate of a Channel
9	Guided transmission media (twisted-pair cable, coaxial cable, fiber-optic cable), and wireless transmission, transmission modes, Parallel and Serial Transmissions
10	**Digital Signals and Digital Transmission:** Line Coding Baseband, Passband,
11	**Multiplexing and Demultiplexing:** FDM,TDM, and CDM
12	Public Switched Telephone Network: Structure of the Telephone System, DSL Trunks and Multiplexing
13	**Switching:** Circuit and Datagram Networks, Virtual-Circuit Networks Circuit switching, packet switching & virtual switching
14	**Wired LANs:** Ethernet Standards, Bridged Ethernet, Switched Ethernet, Fast Ethernet And Gigabit Ethernet
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to Network Lab
2	**Lab 2:** Network Transmission media
3	**Lab 3**: Cables and LAN tester
4	**Lab 4:** Network Devices 1
5	**Lab 5:** Network Devices 2
6	**Lab 6:** Peer-to-peer Network
7	**Lab 7:** Building LAN Network using Hub 1
8	**Lab 8:** Building LAN Network using Hub 2
9	**Lab 9:** Network Tools
10	**Lab 10:** Network commands 1
11	**Lab 11:** Network commands 2
12	**Lab 12:** Introduction to Internet Protocol (IP)
13	**Lab 13:** IP addressing 1
14	**Lab 14:** IP addressing 2

Workload & ECTS Credits of The Course Unit :	**BCCTE306-S1 Computer Networks Fundamentals**		
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

CONTROLLERS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE301-S2	**Controllers**	2	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Zaid G. Mohammed**
Instructor(s) of the Course Unit	**Zaid G. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the student to learn the architecture of a PIC Microcontroller and get acquainted with their use for control purposes. In addition, it will provide the knowledge of applications and interfacing of microcontrollers used in the field of instrumentation & control. Thus, this course is very useful for instrumentation engineers working in the area of embedded systems.
Contents of the Course Unit:	1- PIC microcontroller Architecture. 2- Microcontroller Programming Model 3- Interface Microcontroller. 4- Practical Application with Microcontroller 5- To design and build a microcontroller based embedded system

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to Microcontroller, Types of Microcontrollers, difference between Microprocessor and Microcontroller.
2	PIC Microcontroller Architecture and PIC Family.
3	Microcontroller Programming Model and Its Instruction Set
4	Interface with Microcontroller Part1 (Push buttons, Switches and 7segment)
5	Interface with Microcontroller Part2 (LCD, GLCD, Relay and Keypad)
6	Interrupt
7	A/D (Analog to Digital interface)
8	Timers (Timer0 and Timer1)
9	Timers (Timer2 and WDT)
10	CCP (Capture and Compare)
11	CCP (PWM)
12	Memory
13	Communication (UART, SPI, I2C)
14	Application and projects of Microcontroller
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to MikroC Platform (LED Blinking)
2	**Lab 2:** Introduction to Proteus Platform (LED Blinking)
3	**Lab 3:** Switches and Bush button Interface
4	**Lab 4:** Interface to 7Segment
5	**Lab 5:** Interface to LCD
6	**Lab 6:** Interrupt
7	**Lab 7:** Analog to Digital
8	**Lab 8:** Interface to keypad
9	**Lab 9:** Relay Interface
10	**Lab 10**: Timers (Timer0 and Timer1)
11	**Lab 11**: CCP (Capture and Compare)
12	**Lab 12**: CCP (PWM)
13	**Lab 13**: Communication (UART, SPI, I2C)
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE301-S2	CONTROLLERS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	2	1	2
Project Work	NA	NA	NA
Seminar	1	2	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	1	2
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	6	1	6
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	6	6
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	3	1.5	2
TOTAL WORKLOAD OF THE COURSE UNIT	**48**	**42**	**102**
Workload (h) / 25			**102÷25**
ECTS Credits allocated for the Course Unit			**4.08**

OPERATING SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE302-S2	**Operating Systems**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Younis Anas Younis**
Instructor(s) of the Course Unit	**Dr. Younis Anas Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Teaches students about the design and implementation of operating systems. The major components of most operating systems, include process management, memory management, and file systems. Students will learn about the tradeoffs between performance and functionality during the design and implementation of an operating system. The course may also cover the historical evolution of operating systems over the last fifty years
Contents of the Course Unit:	Operating system, Types of, Terms and concepts of operating systems

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to operating system
2	Types of operating systems (Windows, Linux, MacOS, Unix)
3	Process management and scheduling
4	Processes and Threads (address spaces, system calls, scheduling)
5	Threads and concurrency
6	Memory management
7	File systems and storage management
8	Input/Output (I/O) management
9	Synchronization (algorithms and structures like locks, semaphores, and monitors)
10	Virtual Memory (paging, page tables, eviction, segmentation)
11	File Systems (the file abstraction, directory structures)
12	File Systems (disk I/O)
13	Virtualization and cloud computing
14	Review
15	**Final Exam.**

No.	Practical Part
1	**Lab1:** Getting Started.
2	**Lab2:** Process Scheduling Simulation
3	**Lab 3:** Building a Simple Operating System - bootstrapping
4	**Lab 4:** Building a Simple Operating System - memory management
5	**Lab5:** Building a Simple Operating System - process management
6	**Lab 6:** File System Implementation - FAT or EXT.
7	**Lab 7:** File System Implementation – EXT.
8	**Lab 8:** Virtual Memory Simulation - virtual memory management - page replacement algorithms.
9	**Lab 9:** Kernel Debugging -Linux
10	**Lab 10:** Kernel Debugging – Windows
11	**Lab 11:** Concurrency Control - synchronization primitives, semaphores
12	**Lab 12:** Concurrency Control - synchronization primitives, monitors
13	**Lab 13:** Device Driver Development - keyboard or mouse driver
14	**Review**

Workload & ECTS Credits of The Course Unit :	**BCCTE302-S2**	**Operating Systems**	
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	14	2	28
Reading	4	1	4
Assignment (Homework)	4	1	4
Project Work	NA	NA	NA
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	4	1	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	14	1	14
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	1	1
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1	4
Total Workload of the Course Unit	**69**	**44.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

SIGNALS AND SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE303-S2	**Signals and Systems**	2	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Mohand L. Ahmed**
Instructor(s) of the Course Unit	**Dr.Mohand L. Ahmed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To learn and understand basic theory of signals and linear systems with continuous and discrete time. To introduce to random signals. The emphasis of the course is on spectral analysis and linear filtering ,basic building blocks of modern communication systems.
Contents of the Course Unit:	1-introduction to signals and systems, 2-types of signals 3. systems modelling 4. signal transformations. 5. signal correlation and convolution.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to signals and systems:** motivation, organization of the course. Examples of signal processing systems. Basic classification of signals - continuous/discrete time, periodic/non-periodic. Transformation of time.
2	**Continuous and discrete time periodic signals:** sinusoids and complex exponentials. Overview of basic notions in complex numbers. Discrete and continuous time systems. Linear, time invariant systms (LTI). Representation of signals as series of pulses, convolution. Describing systems using differential and difference equations.
3	**Continuous time signals** periodic Non-periodic signals and Fourier series
4	**Continuous time signals:** Some examples of Fourier series - Signal energy - Parseval's theorem.
5	**Continuous time signals frequency analysis:** Fourier transform, spectral function. Spectra of typical signals.
6	**Continuous-time systems :** Laplace transform, transfer function, frequency response, stability. Example of a simple analog circuit.
7	**Sampling and reconstruction:** ideal sampling, aliasing, sampling theorem. Spectrum of sampled signal, ideal reconstruction. Normalized time and frequency quantization.
8	**Discrete-time signals and their frequency analysis:** Discrete Fourier series, Discrete-time Fourier transform. Circular convolution, fast convolution.
9	**Discrete-time signals and their frequency analysis:** Fast fourier transform(FFT) .
10	**Discrete systems - z-transform:** finite and infinite impulse response systems (FIR and IIR), transfer function, frequency response, stability. Example of a digital filter.
11	**Discrete systems cont'd:** design of simple digital filters, sampling of frequency response, windowing. Links between continuous-time and discrete-time systems.
12	**Random signals:** random variable, realization, distribution function, probability density function (PDF). Stationarity and ergodicity.
13	**Parameters of a random signal:** mean, Estimation - ensemble and temporal.
14	**Random signals cont'd:** correlation function, power spectral density (PSD). Processing of random signals by LTI systems.
15	**Final exam**

No.	PRACTICAL PART
1	**Lab 1:** Represent basic signals like:Unit Impulse, Ramp, Unit Step,Exponential.
2	**Lab 2:** Generating and plotting of continuous and discrete-time signals in MATLAB**.**
3	**Lab3:**Ilustrate the Nyquist sampling theorem
4	**Lab 4**: Signals Transformations
5	**Lab 5**: Perform convolution between two vectors
6	**Lab 6:** Convolution between signals and sequences.
7	**Lab 7:**signal correlation(Auto and cross correlation)
8	**Lab 8:** Fourier Series
9	**Lab 9**:. Fourier transforms and inverse fourier transform
10	**Lab 10:** Prpperties of fourier transform.
11	**Lab 11:** Discrete-time Signals in Frequency Domain.
12	**Lab 12:** Compute DFT and IDFT of a given sequence .
13	**Lab 13:** Fast fourier transfom (FFT).
14	**Lab 14:**. Laplace Transform
15	**Lab 15**: Z-Transform and Inverse Z-Transform Analysis

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCCTE303-S2**	**SIGNALS AND SYSTEMS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	1	2	2
Land Surveying	NA	NA	NA
Group Work	1	2	2
Laboratory	15	2	30
Reading	NA	NA	NA
Assignment (Homework)	4	2	8
Project Work	1	2	2
Seminar	1	1	1
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	2	2
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	3	2	6
Final Exam	1	3	3
Preparation for the Final Exam	1	4	4
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	0.5	2
TOTAL WORKLOAD OF THE COURSE UNIT	**54**	**31**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

WIRELESS SENSOR NETWORK AND IOT Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE304-S2	**Wireless Sensor Network and IoT**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmed Khazal Younis**
Instructor(s) of the Course Unit	**Dr. Ahmed Khazal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To make students understand the basics of Wireless sensor Networks. • To familiarize with learning of the Architecture of WSN. • To understand the concepts of Networking and Networking in WSN. • To study the design consideration of topology control. • To introduce the hardware and software platforms and tool in WSN. • development of Internet of Things (IoT) prototypes. • devices for sensing, actuation, processing, and communication. to help students to develop skills and experiences.
Contents of the Course Unit:	**1.** Overview of Wireless Sensor Networks. **2.** Hardware Platforms. **3.** Topologies of wireless sensor networks. **4.** Types of wireless sensor networks. **5.** Routing protocols. **6.** Localization. **7.** Embedded Operating Systems. **8.** Introduction to IOT. **9.** Controller use in IOT. **10.** Hardware in IOT. **11.** IOT Communication Protocols. **12.** IOT Communication Module. **13.** Cloud Platforms for IOT. **14.** Applications.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**OVERVIEW OF WIRELESS SENSOR NETWORKS:** • Introduction to Wireless Sensor Network. • Network Characteristics. • Key Technologies for Wireless Sensor Networks. • Applications of Wireless Sensor Networks.

2	**Hardware Platforms:**
	• Hardware parameters.
	• sensor nodes of a WSN:
	  ○ sensing unit,
	  ○ computational unit, and
	  ○ communication unit.

3	**Topologies of wireless sensor networks**: • Star Topology. • Tree Topologies. • Mesh Topologies.
4	**Types of Wireless Sensor Networks:** • Terrestrial WSNs. • Underground WSNs. • Underwater WSNs. • Multimedia WSNs. • Mobile WSNs.
5	**Routing protocols:** • Routing Challenges. • Data-centric. • Geographic Routing. • Broadcast, and Multicast.

	• MANET protocols. • Resource-aware routing.
6	**Localization:** • Overview of different localization techniques
7	**Embedded Operating Systems:** • Operating Systems for Wireless Sensor Networks • Operating System Design • Examples of Operating Systems: TinyOS , Mate ,MagnetOS , and MANTIS
8	**Introduction to IOT:** • Network Architecture. • Device Architecture. • Embedded system in IOT. • Application of IOT.
9	**Controller use in IOT:** • Arduino, ESP, and Rasberry-Pi boards. • Comparison between Arduino, ESP, and Rasberry-Pi boards • Hardware and Software Description. • Programming Software.
10	**Hardware in IOT:** Basic Electronics Components of IOT: LED, Resistors, Capacitors, Transistors, Relay, Switch, Diode, Zener
11	**IOT Communication Protocols:** • Wireless Protocols (SPI, I2C, USART, UART, Modbus). • Networking Protocols (OSI Reference Model, TCP/IP, Ethernet**).**
12	**IOT Communication Module:** • RF Module. • Bluetooth module. • GSM Module. • LAN Module. • Wifi Modul.
13	**Cloud Platforms for IOT:** • Virtualization concepts and Cloud Architecture. • Cloud computing, benefits. • Cloud providers & offerings. • Study of IOT Cloud platforms . • ThingSpeak API and MQTT. • Interfacing **IOT** with Web services.
14	**Applications:** Application example of Wireless Sensor Network and IOT.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction of Embedded platform: Arduino and Raspberry Pi
2	**Lab 2:** Architecture of Raspberry Pi part1
3	**Lab 3**: Architecture of Raspberry Pi part2
4	**Lab 4:** Software for the Raspberry Pi
5	**Lab 5:** Configuration of the Raspberry Pi part1
6	**Lab 6:** Configuration of the Raspberry Pi part2
7	**Lab 7:** Programming Raspberry Pi with Python
8	**Lab 8:** Basic Led Blinking
9	**Lab 9:** Controlling of Gas Detecting Sensor.
10	**Lab 10:** Controlling the Pressure Sensor
11	**Lab 11:** Controlling the operation of Servo Motor
12	**Lab 12:** Servo Motor Control with Webpage
13	**Lab 13:** Temperature and Humidity Monitoring in Cloud Platform
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE304-S2 WIRELESS SENSOR NETWORK AND IOT		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

DIGITAL COMMUNICATION SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE305-S2	**Digital Communication Systems**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Hakam Marwan Zaidan**
Instructor(s) of the Course Unit	**Hakam Marwan Zaidan**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The primary objectives of the course on Digital Communication Systems are to provide students with a comprehensive understanding of the fundamental principles, techniques, and technologies used in digital communication. The course aims to familiarize students with various modulation schemes, coding techniques, and signal processing algorithms used in modern communication systems. By the end of the course, students should be able to design, analyze, and evaluate digital communication systems, including the selection of appropriate modulation schemes, error control coding, and channel equalization methods. The course also emphasizes hands-on experience through practical labs to enhance students' skills in implementing and simulating digital communication systems using MATLAB or similar tools. Overall, the course aims to equip students with the knowledge and practical skills necessary for the design and optimization of reliable and efficient digital communication systems.
Contents of the Course Unit:	Error detection and correction, channel coding and interleaving, spread spectrum techniques, MIMO, digital communication system design.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Review of Fundamentals** • Recap of digital communication fundamentals • Signal representation and manipulation • Fourier analysis and frequency domain representation
2	**Baseband Digital Transmission** • Baseband transmission and its limitations • Pulse shaping and matched filtering • Eye diagrams and intersymbol interference (ISI)
3	**Line Coding and Equalization** • Line coding techniques (Unipolar, Polar, Bipolar) • Nyquist ISI criterion and equalization techniques • Decision feedback equalization (DFE)
4	**Bandpass Digital Transmission** • Introduction to bandpass transmission • Digital modulation schemes (ASK, FSK, PSK) • Coherent and non-coherent detection techniques
5	**Error Detection and Correction** • Introduction to error detection and correction codes • Linear block codes (Hamming, Reed-Solomon) • Convolutional codes and Viterbi decoding
6	**Channel Coding and Interleaving** • Introduction to channel coding techniques • Turbo codes and iterative decoding • Interleaving and de-interleaving techniques
7	**Multiple Access Techniques** • Multiple access schemes (FDMA, TDMA, CDMA) • Random access protocols (ALOHA, slotted ALOHA) • Carrier Sense Multiple Access (CSMA) protocols
8	**Spread Spectrum Techniques** • Direct Sequence Spread Spectrum (DSSS) • Frequency Hopping Spread Spectrum (FHSS) • Code Division Multiple Access (CDMA)
9	**Digital Modulation Techniques** • Quadrature Amplitude Modulation (QAM)

	• Orthogonal Frequency Division Multiplexing (OFDM) • Bit and symbol error rate analysis
10	**Wireless Communication Systems** • Cellular communication concepts • Multiple access in cellular networks • Wireless network architectures (2G, 3G, 4G, 5G)
11	**MIMO Communication Systems** • Introduction to Multiple-Input Multiple-Output (MIMO) • Spatial multiplexing and diversity techniques • MIMO channel capacity and beamforming
12	**Channel Estimation and Equalization** • Channel estimation techniques for MIMO systems • MIMO equalization algorithms • Performance analysis in MIMO channels
13	**Digital Communication System Design** • System-level design considerations • Link budget analysis and system performance metrics • Design trade-offs and practical implementation challenges
14	**Advanced Topics and Emerging Technologies** • Overview of advanced topics (Cognitive radio, Massive MIMO) • Introduction to emerging technologies (IoT, 5G+, etc.) • Discussion on current research trends and future prospects
15	**Final Exam.**

No.	PRACTICAL PART
1	**Introduction to MATLAB** • Getting started with MATLAB environment • Basic operations, variables, and functions
2	**Pulse Amplitude Modulation (PAM)** • Generation and demodulation of PAM signals • Performance analysis and comparison of PAM schemes
3	**Pulse Code Modulation (PCM)** • Implementation of PCM encoding and decoding • Analysis of quantization noise and signal-to-noise ratio (SNR**)**
4	**Line Coding Techniques** • Implementation and comparison of line coding schemes • Performance evaluation using eye diagrams
5	**Digital Modulation Techniques** • Implementation of ASK, FSK, and PSK modulation schemes • Analysis of modulation performance in AWGN channel
6	**Error Detection and Correction** • **Implementation of error detection codes (CRC, Hamming)** • **Performance analysis using error detection probability**
7	**Channel Coding with Convolutional Codes** • Encoder and decoder implementation for convolutional codes • BER performance analysis with Viterbi decoding
8	**Spread Spectrum Techniques** • Simulation of Direct Sequence Spread Spectrum (DSSS) • Performance analysis in the presence of interference
9	**Orthogonal Frequency Division Multiplexing (OFDM)** • OFDM signal generation and demodulation • Analysis of frequency and timing synchronization
10	**Multiple Access Techniques** • Simulation of FDMA, TDMA, and CDMA systems • Performance comparison under varying load conditions
11	**MIMO Systems** • Simulation of MIMO transmission and reception • Analysis of capacity and diversity gains
12	**Channel Estimation and Equalization in MIMO** • Channel estimation techniques in MIMO systems • Equalization algorithms and performance evaluation
13	**Wireless Channel Simulation** • Simulation of fading channels (Rayleigh, Rician) • Impact of channel conditions on system performance
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT: BCCTE305-S1 DIGITAL COMMUNICATION SYSTEMS			
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

COMPUTER NETWORKS SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE306-S2	**Computer Networks Systems**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ziyad Khalaf Farej**
Instructor(s) of the Course Unit	**Dr. Ziyad Khalaf Farej**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The main objective of computer network systems is to enable communication and facilitate the exchange of information and resources between different computers and devices. Computer networks enable communication and data sharing, allowing users to access and utilize information and services from remote locations.
Contents of the Course Unit:	1- Introduction to Local Area Networks Standards 2- Data Link Layer Design Issues 3- Transport layer Process-la-Process Delivery 4- Network Layer 5- Wireless LANs

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Local Area Networks Standards:** Medium Access Control, Ethernet (CSMA/CD) and Token MAC protocols
2	LAN performance; Token ring and CSMA/CD performance Evaluation
3	Introduction to Data-Link Layer; High-level Data Link Control (HDLC) and Point-to-Point Protocol (PPP)
4	**Data Link Layer Design Issues:** Framing, Error Control, and Flow Control
5	Automatic Repeat Request (ARQ), Stop-And-Wait Protocol and Sliding Window Protocols
6	Link Throughput, Utilization and Efficiency
7	Effect of Errors on Throughput Effect of Sliding Window and ARQ on Throughput
8	Introduction, Error Detection and Correction, Types of Errors, Redundancy, Forward Error Correction
9	Block Coding, Error detection, Cyclic Codes, Cyclic Redundancy Check, Hardware Implementation
10	**Transport layer; Process-la-Process Delivery** UDP, TCP and SCTP, Features and Connection
11	TCP Congestion Control, Timers Open loop and Close loop Congestion Control
12	**Network Layer:** Delivery, Forwarding, and Routing
13	Unicast Routing Protocols; Intra- and Interdomain Routing Multicast and Broadcast Routing Protocols
14	**Wireless LANs;** IEEE 802.11 Standards and Bluetooth
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to wireless networks
2	**Lab 2:** Wireless network characteristics
3	**Lab 3**: IEEE 802.11 standards
4	**Lab 4:** Wireless Access point
5	**Lab 5:** Wireless Station
6	**Lab 6:** Data Routing Algorithm
7	**Lab 7:** Introduction to Network Management software
8	**Lab 8:** Mikrotik system
9	**Lab 9:** Mikrotik hardware devices
10	**Lab 10:** Winbox software
11	**Lab 11:** Firewall configuration
12	**Lab 12:** Hotspot management
13	**Lab 13:** User manager
14	**Lab 14:** Network advanced tools

Workload & ECTS Credits of The Course Unit :	**BCCTE306-S2 Computer Networks Systems**		
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	6	1	6
Project Work	1	2	2
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	1	5
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	1	5
Final Exam	1	3	3
Preparation for the Final Exam	1	15	15
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	9	9
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1	8
Total Workload of the Course Unit	**70**	**43.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

SUMMER TRAINING 2 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE307-S2	**Summer Training 2**	2	2	1	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Basma MohammedKamal Younis**
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	1- ربط المعرفة المكتسبة من الطالب خلال دراسته االاكاديمية بالمشاكل الحقيقة على ارض الواقع 2- اكتشاف بيئة العمل واحتياجاتها وقيودها 3- القدرة على تحديد المتطلبات المطلوبة لايجاد حلول مناسبة وفعالة للمشاكل الحقيقية على ارض الواقع مع وجود قيود فنية مختلفة 4- القدرة على تكوين رؤية واضحة حول الاهداف والمعوقات والعمل بشكل فعال 5- ايجاد الطالب استقالاليته باكتسابه لمهارات جديدة مع اشراف بسيط من قبل جهة التدريب . 6- القدرة على ايجاد حلول مناسبة في حال حدوث اي تغيير في متطلبات العمل وقيوده 7- القدرة على التواصل مع الكثير من االشخاص المتواجدين في المجال العملي . 8- تعلم المسؤوليات الاخلاقية والاحترافية.
Contents of the Course Unit:	- تشغيل وصيانة شبكات الحاسبات - انواع شبكات الحاسبات - البروتوكولات المتبعة في شبكات الحاسبات

WEEK	KEY LEARNING OUTCOMES OF THE COURSE UNIT : PRACTICAL PART
1	- تعريف الطالب على اقسام الموقع التدريبي والاطلاع على سير العمل وطبيعة ادارة شبكات الحاسبات داخل الموقع التدريبي
2	- اعطاء نبذة مختصرة عن اجزاء شبكات الحاسبات والية عملها والبروتوكولات التي تنظم عمل هذه الشبكات وتعريف الطالب على انواع شبكات الحاسبات من حيث النطاق الجغرافي
3	- تعريف الطالب على كيفية انشاء شبكات محلية وبرمجة الاجهزة الشبكية مثل(switchs, router, access point)
4	- تعريف الطالب على كيفية انشاء شبكات الواسعة النطاق (WAN) وبرمجة الاجهزة الشبكية مثل (power beam, sector ...etc)
5	**Final Exam**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE307-S2 SUMMER TRAINING 2		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVATES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	4	5	20
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	NA	NA	NA
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	4	2	8
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	1	1
Preparation for the Final Exam	1	2	2
Mid-Term Exam	NA	NA	NA
Preparation for the Mid-Term Exam	NA	NA	NA
Short Exam (Quizzes)	NA	NA	NA
Preparation for the Short Exam	NA	NA	NA
TOTAL WORKLOAD OF THE COURSE UNIT	27	15	50
Workload (h) / 25			**50÷25**
ECTS Credits allocated for the Course Unit			**2**

CONTROL ENGINEERING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE301-S1	**Control Engineering**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Ziad Saeed Mohammed**
Instructor(s) of the Course Unit	**Dr.Ziad Saeed Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	It is considered to be familiar with the components of the control circuits, the types of controllers, their uses and their applied circuits. Learn about automatic control systems, their analysis and representation methods for checking the stability, and their practical applications in engineering fields.
Contents of the Course Unit:	1- Definition of a control system, and type classifications. 2- Modelling of a control system, and Transfer Function with block diagrams representation. 3- Control system stability and methods, system performance (with steady state error calculations). 4. Time and Transient response specifications. 5- root locus method Analysis. 6-Frequency response analysis, (Bode Plots). 7- Compensations with design the active types of controllers.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to linear control system, open and closed loop system.
2	Mathematical modeling of physical systems and transfer functions,
3	Mathematical modeling of D.C. Servo Motor. State space representation and analysis.
4	Transfer function, block diagram representation and reduction diagram.
5	Transfer function, block diagram representation and reduction diagram.
6	Time domain analysis, steady–state transient analysis. Part-1
7	Time domain analysis, steady–state transient analysis. Part-2
8	Stability analysis and Routh stability criteria.
9	Root Locus Technique. Part-1
10	Root Locus Technique. Part-2
11	Frequency Response analysis, phase, gain margin and bode plots. Part-1
12	Frequency Response analysis, phase, gain margin and bode plots. Part-2
13	Compensation, phase–lag compensation lag–lead compensation.
14	P, PI, PD, and PID Modes of Feedback Control, Realization of PID Controller Using Active and Passive Elements.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab1:** ExplanationofCKL003 Board+ D.C. motor speed control.
2	**Lab2:**The linear operational amplifier as computational element.
3	**Lab 3:** Dimmer light control+ Temperature control.
4	**Lab 4:** Three steps control.
5	**Lab 5:** Alternating current control motors using (ON-OFF) switching.
6	**Lab 6:** Control on operation of two motors in sequences+ Liquid level control system.
7	**Lab 7:** Transfer function part1+ Transfer function part2
8	**Lab 8:** Response of second order system.
9	**Lab 9**: Frequency response (Bode plots).
10	**Lab 10:** Frequency response (polar plots and Nyquist plots).
11	**Lab 11:** Speed control and error correction for C-L using PD controller.
12	**Lab 12**: Proportional-integral controller.
13	**Lab 13**: Proportional plus integral plus derivative controller or PID.
14	**Lab 14:** The Control Function of Time Delay Valve 3/2 Way. (NORMALY CLOSED)

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE301-S1 CONTROL ENGINEERING		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

MICROPROCESSOR SUPPORTED CHIPS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE302-S1	**Microprocessor Supported Chips**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Abdullah Mohammed A. Hamdoon**
Instructor(s) of the Course Unit	**Abdullah Mohammed A. Hamdoon**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The lectures are focus on the design and implementation of microprocessor-based systems. This includes discussing the different components that suport microproceesor to interface external peripherals devices by supported chips. Students learn about the bus architecture, interrupt handling, Direct Memory Access, Serial input/output, analog input/output and I/O techniques. All the above Knowlsdge enable students to read the data sheet of any devices and understand how it work and connecting with microprocessor.
Contents of the Course Unit:	1- Design hardware interface circuit with microproccer. 2- Connecting input/output device with PPI chip. 3- Generate differences clocks, rate generate pulses, and events counting for peripherals devices. 4- Using interrupt to input/ output data. 5- Input / output serial data. 6- Input / output analog data.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Microprocessor interfacing Circuit Design
2	8255 Programmable Peripheral Interface (PPI) I
3	8255 Programmable Peripheral Interface (PPI) II
4	8254 Programmable Interval Timer (PIT) I
5	8254 Programmable Interval Timer (PIT) II
6	Microprocessor Interrupts
7	8259A Programmable Interrupt Controller(PIC) I
8	8259a Programmable Interrupt Controller(PIC) II
9	8237 Programming Direct Memory Access (DMA) Controller I
10	8237 Programming Direct Memory Access (DMA) Controller II
11	16550 Programmable Communication Interface
12	16550 Programmable Communication Interface Applications
13	Analog-to-Digital Conversion Application ADC0804
14	Digital-to-Analog Conversion Application DAC0808
15	**Final Exam**

No.	PRACTICAL PART

1	**Lab 1:** Training on Proteus Program to Make Processor work
2	**Lab 2:** Microprocessor interfacing Circuit Design in Protues (Leds and Switches)
3	**Lab 3:** Microprocessor interfacing Circuit Design in Protues (Seven Segment Display (SSD))
4	**Lab 4:** Programmable Peripheral Interface (Keypad and SSD)
5	**Lab 5:** Programmable Peripheral Interface (Application)
6	**Lab 6:** Programmable Interval Timer
7	**Lab 7:** Programmable Interval Timer (Application)
8	**Lab 8:** Microprocessor Interrupts Design
9	**Lab 9:** Programmable Interrupt Controller
10	**Lab 10**: Programmable Communication Interface
11	**Lab 11**: Programmable Communication Interface Application
12	**Lab 12**: Analog-to-Digital Conversion Application (ADC0804)
13	**Lab 13**: Digital-to-Analog Conversion Application (DAC0808)
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCETE302-S1**	**MICROPROCESSOR SUPPORTED CHIPS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	1	2
Land Surveying	NA	NA	NA
Group Work	4	1	5
Laboratory	14	2	28
Reading lectures in home	14	2	28
Assignment (Homework)	5	1	5
Project Work	NA	NA	NA
Seminar	1	3	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	16	16
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	8	8
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	2	1.5	3
TOTAL WORKLOAD OF THE COURSE UNIT	**72**	**47**	**152**
Workload (h) / 25			**152÷25**
ECTS Credits allocated for the Course Unit			**6**

DIGITAL SIGNAL PROCESSING programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE303-S1	**Digital Signal Processing**	1	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Mohand L. Ahmed**
Instructor(s) of the Course Unit	**Dr.Mohand L. Ahmed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Provide background and fundamental material for the analysis and processing of digital signals and to familiarize the relationships between continuous-time and discrete-time signals and systems. study fundamentals of time, frequency and z-plane analysis and to discuss the inter-relationships of these analytic method and to study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications. Implement discrete time systems, recursive and nonrecursive realizations.
Contents of the Course Unit:	DSP basic concepts such as sampling, reconstruction and aliasing Discrete-Time Signal Processing fundamentals of time, frequency and z-plane analysis Filter Design — Continuous and Discrete Fundamental filtering algorithms such as FIR, IIR, FFT.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Digital Signal Processing(DSP) system:** What DSP,general block diagram,classification and its properties.
2	**A/D and D/A conversion :** Understand how digital to analog (D/A) and analog to digital (A/D) converters operate on a signal and be able to model these operations mathematically
3	**Discrete-Time Signal processing:** Define simple non-periodic discrete-time sequences such as the impulse and unit step, and perform time shifting and time-reversal operations on such sequences
4	**Discrete-Time Signal Transformations:** Time –Reversal ,Time – Scaling and Time –Shifting
5	**Discrete-Time Signal Amplitude Transformation:** Amplitude – Reversal ,Amplitude – Scaling and Amplitude – Shifting
6	**Discrete –Time Systems :** Interconnected System ,Definition,Types of Interconnected Systems and their mathematical Models
7	**Properties of Discrete-Time Systems :** System with Memory,Causality and Time –Invariant System
8	**Properties of Discrete-Time Systems :** Inverse of Systems,Time Invariance,Stability and Linearity
9	**Discrete-Time Systems :** Given the difference equation of a discrete-time system to demonstrate linearity, time-invariance, causality and stability, and hence show whether or not a given system belongs to the important class of causal, LTI systems
10	**Discrete-Time system:** Given the impulse response of a causal LTI system, show whether or not the system is bounded-input/bounded-output (BIBO) stable.
11	**Convolution of Discrete-Time Systems:** Properties of Discrete-time systems with convolution .Convolution with impulse response and for definite discrete-time signals
12	**Time/Frequency Domain Representation of Signals:** Perform time, frequency and Z-transform analysis on signals**.**
13	**Discrete-Time Fourier Transform :** Define the Discrete Fourier Transform (DFT) and the inverse DFT (IDFT) of length N
14	**Digital Filters :** Introduction to finite impulse response (FIR) and infinite impulse response (IIR) filters ,the differnce between them and their characteristic. **Design filters:** . Design of infinite impulse response (IIR) filters and finite impulse response (FIR) filters for a given specification.
15	**Final Exam**

No.	Practical Part
1	**Lab 1:** Represent basic signals like:Unit Impulse, Ramp, Unit Step,Exponential.
2	**Lab 2:**. Generate discrete sine and cosine signals with given sampling frequency
3	**Lab3:**Ilustrate the Nyquist sampling theorem
4	**Lab 4**: Represent complex exponential as a function of real and imaginary part.
5	**Lab 5**: Determine impulse and step response of two vectors.
6	**Lab 6**: Perform convolution between two vectors .
7	**Lab7:** Determine rational z-transform from the given poles and zeros .
8	**Lab 8:** Compute DFT and IDFT of a given sequence .
9	**Lab 9:** Compute the DFT of a sequence x (n) using DIT and DIF algorithm.
10	**Lab 10:** Perform linear convolution of two sequence using DFT .
11	**Lab 11**: Design Band pass and Band reject FIR linear phase filter using Hamming and Hanning windows
12	**Lab 12:** Design a Type 1 Chebyshev IIR highpass filter.
13	**Lab 13:** Design an IIR Elliptic low pass filter.
14	**Lab14:** design an IIR Butterworth bandpass filter
15	**Lab 15:** To study coefficient quantization effects on the frequency response of acascade form IIR filter .

Workload & ECTS Credits of The Course Unit :	**BCETE303-S1**	**Digital Signal Processing**	
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	1	2	2
Land Surveying	NA	NA	NA
Group Work	1	2	2
Laboratory	15	2	30
Reading	NA	NA	NA
Assignment (Homework)	4	2	8
Project Work	1	2	2
Seminar	1	1	1
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	2	2
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	3	2	6
Final Exam	1	3	3
Preparation for the Final Exam	1	4	4
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	0.5	2
Total Workload of the Course Unit	**54**	**31**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

ENGINEERING ANALYSIS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE304-S1	**Engineering Analysis**	1	4	3	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Orjuwan Mohammed Abduljawad Al-Jawadi**
Instructor(s) of the Course Unit	**Orjuwan Mohammed Abduljawad Al-Jawadi**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To help students to understand the engineering analysis transformations in complex frequencies domains, in order to solve complicated mathematical and electrical circuits.
Contents of the Course Unit:	1 – Laplace Transform 2 – Z-Transform 3 – Probability 3 – Numerical Computations 4 – Solution of non-Linear equations 5- Numerical solution of ordinary differential equation

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Continues Unit Step Function and Impulse Function Definition
2	Laplace transform, Properties, theorems and applications
3	Laplace Inverse Transform, Properties, theorems and applications
4	Z-transform, properties, theorems, and applications
5	Z- Inverse Transform, properties, theorems, and applications
6	Probability: Basic terminology, probability and set notation
7	Probability: law of probability, independent events
8	Statistics: Graphical representation, measure of central tendency
9	Statistics: measure of dispersion
10	Numerical computations: bisection method, false position method
11	Newton-Raphson method: solution of algebraic equations, Newton-Raphson method: transcendental equations
12	Solution of linear simultaneous equations: 1) Direct methods (Gauss elimination, Gauss Jordan) 2) Iterative method (Jacobi's, Gauss-seidel iteration)
13	Numerical solution of ordinary differential equation (Picard's , Euler's method)
14	Solution of nonlinear equation (Newton-Raphson method)
15	**Final Exam**

No.	Practical Part
1	**Lab 1:** Introduction to Unit Step Function and Impulse Function
2	**Lab 2:** Plotting and Control Flow in MATLAB
3	**Lab 3:** Laplace Transform Definition
4	**Lab 4:** Laplace Transform Properties
5	**Lab 5:** Inverse Laplace Transform
6	**Lab 6:** Inverse Laplace Transform by Partial Fractions
7	**Lab 7:** Solving Complex Electrical Circuits using Laplace Transform
8	**Lab 8:** Z-Transform
9	**Lab 9:** Z-Transform Properties
10	**Lab 10:** Inverse of Z-Transform
11	**Lab 11:** Solution of Special DE function using Simulink
12	**Lab 12:** System Stability using Z-Transform
13	**Lab 13:** Newton –Raphson Method
14	**Lab 14:** Taylor Series in MATLAB

Workload & ECTS Credits of The Course UNIT:	**BCETE304-S1**	**Engineering Analysis**	
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	2	1	2
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	2	1	2
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	1	1	1
Final Exam	1	3	3
Preparation for the Final Exam	1	1	1
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	1	1
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	2	1.5	3
Total Workload of the Course Unit	**44**	**16**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

DIGITAL COMMUNICATION FUNDAMENTALS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE305-S1	**Digital Communication Fundamentals**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Hakam Marwan Zaidan**
Instructor(s) of the Course Unit	**Hakam Marwan Zaidan**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To introduce students to the fundamental concepts, principles, and techniques underlying digital communication systems. The course aims to provide a solid foundation in understanding various components of digital communication, including modulation techniques, channel coding, multiplexing, and error detection and correction. By the end of the course, students should be able to analyze and design digital communication systems, evaluate their performance in different channel conditions, and make informed decisions regarding the selection of appropriate modulation and coding schemes. The course also emphasizes the practical aspects of digital communication through hands-on experiments and simulations. Overall, the course aims to equip students with a comprehensive understanding of digital communication principles and the skills necessary for the design and implementation of efficient and reliable digital communication systems.
Contents of the Course Unit:	Introduction to digital communication, Modulation techniques, Introduction to coding, Multiple access techniques.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Digital Communication:** Overview of digital communication systems, Analog vs. digital communication, Elements of a digital communication system
2	**Signals and Systems:** Signal representation and manipulation, Fourier analysis and frequency domain representation Time and frequency domain characteristics of signals.
3	**Modulation Techniques:** Introduction to digital modulation techniques (ASK, FSK, PSK), Performance metrics: modulation index, bandwidth, power efficiency
4	**Pulse Amplitude Modulation (PAM):** Introduction to PAM and its applications, PAM waveform generation and detection, Performance analysis of PAM in the presence of noise.
5	**Pulse Code Modulation (PCM):** Sampling theorem and Nyquist criterion, Quantization and coding of PCM signals, Quantization noise and signal-to-noise ratio (SNR).
6	**Baseband Transmission:** Introduction to bandpass transmission, Analog and digital modulation schemes, Coherent and non-coherent detection techniques
7	**Baseband Transmission:** Introduction to bandpass transmission, Analog and digital modulation schemes, Coherent and non-coherent detection techniques
8	**Error Detection and Correction:** Introduction to error detection and correction codes, Parity check, Hamming codes, and cyclic redundancy check (CRC), Bit error rate (BER) and its calculation
9	**Channel Capacity and Coding:** Shannon's channel capacity theorem, Channel capacity limits for various communication channels, Channel coding techniques (Block codes, Convolutional codes)
10	**Multiple Access Techniques**
11	**Equalization and Diversity**
12	**Spread Spectrum Techniques**
13	**Wireless Communication Systems**
14	**Introduction to Digital Modulation**
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to MATLAB/Simulink
2	**Lab 2:** Signal Analysis and Fourier Transform
3	**Lab 3:** Digital Modulation Techniques
4	**Lab 4:** Pulse Amplitude Modulation (PAM)
5	**Lab 5:** Pulse Code Modulation (PCM)
6	**Lab 6:** Line Coding Techniques
7	**Lab 7:** Baseband Transmission
8	**Lab 8:** Analog and Digital Modulation
9	**Lab 9:** Error Detection and Correction
10	**Lab 10:** Channel Capacity and Coding
11	**Lab 11:** Multiple Access Techniques
12	**Lab 12:** Equalization and Diversity
13	**Lab 13:** Spread Spectrum Techniques
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit : BCETE305-S1 Digital Communication Fundamentals			
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
Total Workload of the Course Unit	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

DIGITAL MICROCONTROLLERS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE306-S1	**Digital MicroControllers**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Zaid G. Mohammed**
Instructor(s) of the Course Unit	**Zaid G. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the student to learn the architecture of a PIC Microcontroller and get acquainted with their use for control purposes. In addition, it will provide the knowledge of applications and interfacing of microcontrollers used in the field of instrumentation & control. Thus, this course is very useful for instrumentation engineers working in the area of embedded systems.
Contents of the Course Unit:	1- PIC microcontroller Architecture. 2- Microcontroller Programming Model 3- Interface Microcontroller. 4- Practical Application with Microcontroller 5- To design and build a microcontroller based embedded system

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to Microcontroller, Types of Microcontrollers, difference between Microprocessor and Microcontroller.
2	PIC Microcontroller Architecture and PIC Family.
3	Microcontroller Programming Model and Its Instruction Set
4	Interface with Microcontroller Part1 (Push buttons, Switches and 7segment)
5	Interface with Microcontroller Part2 (LCD, GLCD, Relay and Keypad)
6	Interrupt
7	A/D (Analog to Digital interface)
8	Timers (Timer0 and Timer1)
9	Timers (Timer2 and WDT)
10	CCP (Capture and Compare)
11	CCP (PWM)
12	Memory
13	Communication (UART, SPI, I2C)
14	Application and projects of Microcontroller
15	Final Exam

No.	PRACTICAL PART
1	**Lab 1:** Introduction to MikroC Platform (LED Blinking)
2	**Lab 2:** Introduction to Proteus Platform (LED Blinking)
3	**Lab 3:** Switches and Bush button Interface
4	**Lab 4:** Interface to 7Segment
5	**Lab 5:** Interface to LCD
6	**Lab 6:** Interrupt
7	**Lab 7:** Analog to Digital
8	**Lab 8:** Interface to keypad
9	**Lab 9:** Relay Interface
10	**Lab 10**: Timers (Timer0 and Timer1)
11	**Lab 11**: CCP (Capture and Compare)
12	**Lab 12**: CCP (PWM)
13	**Lab 13**: Communication (UART, SPI, I2C)
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE306-S1	DIGITAL MICROCONTROLLERS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

COMPUTER GRAPHICS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE301-S2	**Computer Graphics**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Basma MohammedKamal Younis**
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course covers a wide range of the field of interactive computer graphics at all levels of abstraction, with an emphasis on both theory and practice. Core topics include: the GPU pipeline, essential mathematics, viewing 3D objects, common geometric data structures, materials modelling, basic drawing, colour science, illumination and rendering.
Contents of the Course Unit:	1- General Information 2- Graphics Output Primitives 3- 2D Computer Graphics Algorithms 4- 3D Computer Graphics Algorithms

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**General Information:** The graphics pipeline, Graphics Devices,
2	**Graphics Output Primitives:** Line Drawing Algorithms(DDA and Bresenham)
3	**Graphics Output Primitives:** Circle and Ellipse Generating Algorithms
4	**2D Computer Graphics Algorithms:** 2D Modeling (Polygons, Geometrical objects)
5	**2D Computer Graphics Algorithms:** Clipping(Cohen-Sutherland Algorithm)
6	**2D Computer Graphics Algorithms:** Two-Dimensional Viewing(zooming and Panning)
7	**2D Computer Graphics Algorithms:** 2D Transformations(Coordinates , Geometric Transformations) 2D Transformations(Homogenous Coordinates amd Matrix algebra for transformations)
8	**2D Computer Graphics Algorithms:** 2D Transformations(Translation, Rotation, Scaling, Reflection, Shear)
9	**Light and Colors** (CIE, RGB, HSV ... etc)
10	**3D Computer Graphics Operations:** Modeling(CSG, Boundary Representation, Octree, BSP_Tree, Parametric Surfaces,Spatial Enumeration)
11	**3D Computer Graphics Operations:** Projection (Parallel and Perspective)
12	**3D Computer Graphics Operations:** 3D Geometric Transformations (Translation, Rotation, Scaling)
13	**3D Computer Graphics Operations:** 3D Clipping (3D Cohen-Sutherland Algorithm)
14	**3D Computer Graphics Operations:** Hidden Surface Removal (z-buffer, octree, Binary tree, painter algorithm... etc.)
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to OpenGL and Display Devices
2	**Lab 2:** Using Build-in OpenGL Graphics Functions
3	**Lab 3**: Line Generation using DDA Algorithm
4	**Lab 4:** Line Generation using Bresenham's Algorithm
5	**Lab 5:** Circle Generation Algorithms
6	**Lab 6:** Coding and Line Clipping using Cohen-Sutherland Algorith
7	**Lab 7:** 2D Transformation; Translation , Scaling, Rotation
8	**Lab 8:** Composite Two-Dimensional Transformation
9	**Lab 9:** Color and Light
10	**Lab 10:** Three-Dimensional Object Representation (Cube, Pyrmid)
11	**Lab 11:** Projection(for Cube using Parallel and Perspective)
12	**Lab 12:** 3D Transformation; Translation , Scaling, Rotation
13	**Lab 13:** Composite Three-Dimensional Transformation
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit :	BCETE301-S2	Computer Graphics	
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	4	1	4
Project Work	NA	NA	NA
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	4	1	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1	8
Total Workload of the Course Unit	**62**	**50.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

OPERATING SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE302-S2	**Operating Systems**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Younis Anas Younis**
Instructor(s) of the Course Unit	**Dr. Younis Anas Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Teaches students about the design and implementation of operating systems. The major components of most operating systems, include process management, memory management, and file systems. Students will learn about the tradeoffs between performance and functionality during the design and implementation of an operating system. The course may also cover the historical evolution of operating systems over the last fifty years
Contents of the Course Unit:	Operating system, Types of, Terms and concepts of operating systems

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to operating system
2	Types of operating systems (Windows, Linux, MacOS, Unix)
3	Process management and scheduling
4	Processes and Threads (address spaces, system calls, scheduling)
5	Threads and concurrency
6	Memory management
7	File systems and storage management
8	Input/Output (I/O) management
9	Synchronization (algorithms and structures like locks, semaphores, and monitors)
10	Virtual Memory (paging, page tables, eviction, segmentation)
11	File Systems (the file abstraction, directory structures)
12	File Systems (disk I/O)
13	Virtualization and cloud computing
14	Review
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab1:** Getting Started.
2	**Lab2:** Process Scheduling Simulation
3	**Lab 3:** Building a Simple Operating System - bootstrapping
4	**Lab 4:** Building a Simple Operating System - memory management
5	**Lab5:** Building a Simple Operating System - process management
6	**Lab 6:** File System Implementation - FAT or EXT.
7	**Lab 7:** File System Implementation – EXT.
8	**Lab 8:** Virtual Memory Simulation - virtual memory management - page replacement algorithms.
9	**Lab 9:** Kernel Debugging -Linux
10	**Lab 10:** Kernel Debugging – Windows
11	**Lab 11:** Concurrency Control - synchronization primitives, semaphores
12	**Lab 12:** Concurrency Control - synchronization primitives, monitors
13	**Lab 13:** Device Driver Development - keyboard or mouse driver
14	**Review**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE302-S2 OPERATING SYSTEMS		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	14	2	28
Reading	4	1	4
Assignment (Homework)	4	1	4
Project Work	NA	NA	NA
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	4	1	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	14	1	14
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	1	1
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1	4
TOTAL WORKLOAD OF THE COURSE UNIT	**69**	**44.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

SIGNALS AND SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE303-S2	**Signals and Systems**	2	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Mohand L. Ahmed**
Instructor(s) of the Course Unit	**Dr.Mohand L. Ahmed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To learn and understand basic theory of signals and linear systems with continuous and discrete time. To introduce to random signals. The emphasis of the course is on spectral analysis and linear filtering ,basic building blocks of modern communication systems.
Contents of the Course Unit:	1-introduction to signals and systems, 2-types of signals 3. systems modelling 4. signal transformations. 5. signal correlation and convolution.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to signals and systems:** motivation, organization of the course. Examples of signal processing systems. Basic classification of signals - continuous/discrete time, periodic/non-periodic. Transformation of time.
2	**Continuous and discrete time periodic signals:** sinusoids and complex exponentials. Overview of basic notions in complex numbers. Discrete and continuous time systems. Linear, time invariant systms (LTI). Representation of signals as series of pulses, convolution. Describing systems using differential and difference equations.
3	**Continuous time signals** periodic Non-periodic signals and Fourier series
4	**Continuous time signals:** Some examples of Fourier series - Signal energy - Parseval's theorem.
5	**Continuous time signals frequency analysis:** Fourier transform, spectral function. Spectra of typical signals.
6	**Continuous-time systems :** Laplace transform, transfer function, frequency response, stability. Example of a simple analog circuit.
7	**Sampling and reconstruction:** ideal sampling, aliasing, sampling theorem. Spectrum of sampled signal, ideal reconstruction. Normalized time and frequency quantization.
8	**Discrete-time signals and their frequency analysis:** Discrete Fourier series, Discrete-time Fourier transform. Circular convolution, fast convolution.
9	**Discrete-time signals and their frequency analysis:** Fast fourier transform(FFT) .
10	**Discrete systems - z-transform:** finite and infinite impulse response systems (FIR and IIR), transfer function, frequency response, stability. Example of a digital filter.
11	**Discrete systems cont'd:** design of simple digital filters, sampling of frequency response, windowing. Links between continuous-time and discrete-time systems.
12	**Random signals:** random variable, realization, distribution function, probability density function (PDF). Stationarity and ergodicity.
13	**Parameters of a random signal:** mean, Estimation - ensemble and temporal.
14	**Random signals cont'd:** correlation function, power spectral density (PSD). Processing of random signals by LTI systems.
15	**Final exam**

No.	PRACTICAL PART
1	**Lab 1:** Represent basic signals like:Unit Impulse, Ramp, Unit Step,Exponential.
2	**Lab 2:** Generating and plotting of continuous and discrete-time signals in MATLAB**.**
3	**Lab3:**Ilustrate the Nyquist sampling theorem
4	**Lab 4**: Signals Transformations
5	**Lab 5**: Perform convolution between two vectors
6	**Lab 6:** Convolution between signals and sequences.
7	**Lab 7:**signal correlation(Auto and cross correlation)
8	**Lab 8:** Fourier Series
9	**Lab 9**:. Fourier transforms and inverse fourier transform
10	**Lab 10:** Prpperties of fourier transform.
11	**Lab 11:** Discrete-time Signals in Frequency Domain.
12	**Lab 12:** Compute DFT and IDFT of a given sequence .
13	**Lab 13:** Fast fourier transfom (FFT).
14	**Lab 14:**. Laplace Transform
15	**Lab 15**: Z-Transform and Inverse Z-Transform Analysis

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCETE303-S2**	**SIGNALS AND SYSTEMS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	1	2	2
Land Surveying	NA	NA	NA
Group Work	1	2	2
Laboratory	15	2	30
Reading	NA	NA	NA
Assignment (Homework)	4	2	8
Project Work	1	2	2
Seminar	1	1	1
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	2	2
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	3	2	6
Final Exam	1	3	3
Preparation for the Final Exam	1	4	4
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	0.5	2
TOTAL WORKLOAD OF THE COURSE UNIT	**54**	**31**	**100**
Workload (h) / 25			**100÷25**
ECTS Credits allocated for the Course Unit			**4**

WIRELESS SENSOR NETWORK AND IOT Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE304-S2	**Wireless Sensor Network and IoT**	1	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmed Khazal Younis**
Instructor(s) of the Course Unit	**Dr. Ahmed Khazal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To make students understand the basics of Wireless sensor Networks. • To familiarize with learning of the Architecture of WSN. • To understand the concepts of Networking and Networking in WSN. • To study the design consideration of topology control. • To introduce the hardware and software platforms and tool in WSN. • development of Internet of Things (IoT) prototypes. • devices for sensing, actuation, processing, and communication. to help students to develop skills and experiences.
Contents of the Course Unit:	**1.** Overview of Wireless Sensor Networks. **2.** Hardware Platforms. **3.** Topologies of wireless sensor networks. **4.** Types of wireless sensor networks. **5.** Routing protocols. **6.** Localization. **7.** Embedded Operating Systems. **8.** Introduction to IOT. **9.** Controller use in IOT. **10.** Hardware in IOT. **11.** IOT Communication Protocols. **12.** IOT Communication Module. **13.** Cloud Platforms for IOT. **14.** Applications.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**OVERVIEW OF WIRELESS SENSOR NETWORKS:** • Introduction to Wireless Sensor Network. • Network Characteristics. • Key Technologies for Wireless Sensor Networks. • Applications of Wireless Sensor Networks.

2	**Hardware Platforms:**
	• Hardware parameters.
	• sensor nodes of a WSN:
	  ○ sensing unit,
	  ○ computational unit, and
	  ○ communication unit.

3	**Topologies of wireless sensor networks**: • Star Topology. • Tree Topologies. • Mesh Topologies.
4	**Types of Wireless Sensor Networks:** • Terrestrial WSNs. • Underground WSNs. • Underwater WSNs. • Multimedia WSNs. • Mobile WSNs.
5	**Routing protocols:** • Routing Challenges. • Data-centric. • Geographic Routing. • Broadcast, and Multicast.

	• MANET protocols. • Resource-aware routing.
6	**Localization:** • Overview of different localization techniques
7	**Embedded Operating Systems:** • Operating Systems for Wireless Sensor Networks • Operating System Design • Examples of Operating Systems: TinyOS , Mate ,MagnetOS , and MANTIS
8	**Introduction to IOT:** • Network Architecture. • Device Architecture. • Embedded system in IOT. • Application of IOT.
9	**Controller use in IOT:** • Arduino, ESP, and Rasberry-Pi boards. • Comparison between Arduino, ESP, and Rasberry-Pi boards • Hardware and Software Description. • Programming Software.
10	**Hardware in IOT:** Basic Electronics Components of IOT: LED, Resistors, Capacitors, Transistors, Relay, Switch, Diode, Zener
11	**IOT Communication Protocols:** • Wireless Protocols (SPI, I2C, USART, UART, Modbus). • Networking Protocols (OSI Reference Model, TCP/IP, Ethernet**).**
12	**IOT Communication Module:** • RF Module. • Bluetooth module. • GSM Module. • LAN Module. • Wifi Modul.
13	**Cloud Platforms for IOT:** • Virtualization concepts and Cloud Architecture. • Cloud computing, benefits. • Cloud providers & offerings. • Study of IOT Cloud platforms . • ThingSpeak API and MQTT. • Interfacing **IOT** with Web services.
14	**Applications:** Application example of Wireless Sensor Network and IOT.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction of Embedded platform: Arduino and Raspberry Pi
2	**Lab 2:** Architecture of Raspberry Pi part1
3	**Lab 3**: Architecture of Raspberry Pi part2
4	**Lab 4:** Software for the Raspberry Pi
5	**Lab 5:** Configuration of the Raspberry Pi part1
6	**Lab 6:** Configuration of the Raspberry Pi part2
7	**Lab 7:** Programming Raspberry Pi with Python
8	**Lab 8:** Basic Led Blinking
9	**Lab 9:** Controlling of Gas Detecting Sensor.
10	**Lab 10:** Controlling the Pressure Sensor
11	**Lab 11:** Controlling the operation of Servo Motor
12	**Lab 12:** Servo Motor Control with Webpage
13	**Lab 13:** Temperature and Humidity Monitoring in Cloud Platform
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE304-S2 WIRELESS SENSOR NETWORK AND IOT		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

DIGITAL COMMUNICATION SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE305-S2	**Digital Communication Systems**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Hakam Marwan Zaidan**
Instructor(s) of the Course Unit	**Hakam Marwan Zaidan**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The primary objectives of the course on Digital Communication Systems are to provide students with a comprehensive understanding of the fundamental principles, techniques, and technologies used in digital communication. The course aims to familiarize students with various modulation schemes, coding techniques, and signal processing algorithms used in modern communication systems. By the end of the course, students should be able to design, analyze, and evaluate digital communication systems, including the selection of appropriate modulation schemes, error control coding, and channel equalization methods. The course also emphasizes hands-on experience through practical labs to enhance students' skills in implementing and simulating digital communication systems using MATLAB or similar tools. Overall, the course aims to equip students with the knowledge and practical skills necessary for the design and optimization of reliable and efficient digital communication systems.
Contents of the Course Unit:	Error detection and correction, channel coding and interleaving, spread spectrum techniques, MIMO, digital communication system design.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Review of Fundamentals** • Recap of digital communication fundamentals • Signal representation and manipulation • Fourier analysis and frequency domain representation
2	**Baseband Digital Transmission** • Baseband transmission and its limitations • Pulse shaping and matched filtering • Eye diagrams and intersymbol interference (ISI)
3	**Line Coding and Equalization** • Line coding techniques (Unipolar, Polar, Bipolar) • Nyquist ISI criterion and equalization techniques • Decision feedback equalization (DFE)
4	**Bandpass Digital Transmission** • Introduction to bandpass transmission • Digital modulation schemes (ASK, FSK, PSK) • Coherent and non-coherent detection techniques
5	**Error Detection and Correction** • Introduction to error detection and correction codes • Linear block codes (Hamming, Reed-Solomon) • Convolutional codes and Viterbi decoding
6	**Channel Coding and Interleaving** • Introduction to channel coding techniques • Turbo codes and iterative decoding • Interleaving and de-interleaving techniques
7	**Multiple Access Techniques** • Multiple access schemes (FDMA, TDMA, CDMA) • Random access protocols (ALOHA, slotted ALOHA) • Carrier Sense Multiple Access (CSMA) protocols
8	**Spread Spectrum Techniques** • Direct Sequence Spread Spectrum (DSSS) • Frequency Hopping Spread Spectrum (FHSS) • Code Division Multiple Access (CDMA)
9	**Digital Modulation Techniques** • Quadrature Amplitude Modulation (QAM)

	• Orthogonal Frequency Division Multiplexing (OFDM) • Bit and symbol error rate analysis
10	**Wireless Communication Systems** • Cellular communication concepts • Multiple access in cellular networks • Wireless network architectures (2G, 3G, 4G, 5G)
11	**MIMO Communication Systems** • Introduction to Multiple-Input Multiple-Output (MIMO) • Spatial multiplexing and diversity techniques • MIMO channel capacity and beamforming
12	**Channel Estimation and Equalization** • Channel estimation techniques for MIMO systems • MIMO equalization algorithms • Performance analysis in MIMO channels
13	**Digital Communication System Design** • System-level design considerations • Link budget analysis and system performance metrics • Design trade-offs and practical implementation challenges
14	**Advanced Topics and Emerging Technologies** • Overview of advanced topics (Cognitive radio, Massive MIMO) • Introduction to emerging technologies (IoT, 5G+, etc.) • Discussion on current research trends and future prospects
15	**Final Exam.**

No.	PRACTICAL PART
1	**Introduction to MATLAB** • Getting started with MATLAB environment • Basic operations, variables, and functions
2	**Pulse Amplitude Modulation (PAM)** • Generation and demodulation of PAM signals • Performance analysis and comparison of PAM schemes
3	**Pulse Code Modulation (PCM)** • Implementation of PCM encoding and decoding • Analysis of quantization noise and signal-to-noise ratio (SNR**)**
4	**Line Coding Techniques** • Implementation and comparison of line coding schemes • Performance evaluation using eye diagrams
5	**Digital Modulation Techniques** • Implementation of ASK, FSK, and PSK modulation schemes • Analysis of modulation performance in AWGN channel
6	**Error Detection and Correction** • **Implementation of error detection codes (CRC, Hamming)** • **Performance analysis using error detection probability**
7	**Channel Coding with Convolutional Codes** • Encoder and decoder implementation for convolutional codes • BER performance analysis with Viterbi decoding
8	**Spread Spectrum Techniques** • Simulation of Direct Sequence Spread Spectrum (DSSS) • Performance analysis in the presence of interference
9	**Orthogonal Frequency Division Multiplexing (OFDM)** • OFDM signal generation and demodulation • Analysis of frequency and timing synchronization
10	**Multiple Access Techniques** • Simulation of FDMA, TDMA, and CDMA systems • Performance comparison under varying load conditions
11	**MIMO Systems** • Simulation of MIMO transmission and reception • Analysis of capacity and diversity gains
12	**Channel Estimation and Equalization in MIMO** • Channel estimation techniques in MIMO systems • Equalization algorithms and performance evaluation
13	**Wireless Channel Simulation** • Simulation of fading channels (Rayleigh, Rician) • Impact of channel conditions on system performance
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT: BCETE305-S1 DIGITAL COMMUNICATION SYSTEMS			
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	3	1	3
Laboratory	14	2	28
Reading	3	1	3
Assignment (Homework)	6	1	6
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	10	10
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**65**	**44**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

DIGITAL CONTROLLERS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE306-S2	**Digital Controller**	1	4	3	4

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Zaid G. Mohammed**
Instructor(s) of the Course Unit	**Zaid G. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the student to learn the architecture of a PLC (Programmable Logic Controller) controller and get acquainted with their use for control purposes. In addition, it will provide the knowledge of applications and interfacing of PLC used in the which is a specialized computer used in industrial automation and control systems. Thus, this course is very useful for instrumentation engineers working in industrial automation.
Contents of the Course Unit:	1- Understand the basics and architecture of PLCs 2- PLC Programming Model 3- Interface with PLC 4- Practical Application with PLC

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Principle of PLC**
2	**Input – Output modules of PLC - Part1**
3	**Input – Output modules of PLC - Part2**
4	**Numbers systems and codes**
5	**Fundamentals of logic in PLC**
6	**Basic of PLC programming**
7	**PLC- wiring diagram and ladders logic program and sensors**
8	**Math Operation**
9	**Timers Programming**
10	**Counters Programming**
11	**Communication with PLC**
12	**Sensors and Actuators for Industrial Applications – Part1**
13	**Sensors and Actuators for Industrial Applications – Part2**
14	**Application and projects of PLC**
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to PLC Programming Software
2	**Lab 2:** Basic Logic Gates
3	**Lab 3:** Interface With PLC
4	**Lab 4:** Analog Signal Processing
5	**Lab 5:** Timers and Counters – Part1
6	**Lab 6:** Timers and Counters – Part2
7	**Lab 7:** Sequential Control
8	**Lab 8:** Communication Protocols
9	**Lab 9:** Motor Control – Part 1
10	**Lab 10**: Motor Control – Part 2
11	**Lab 11**: Motor Control – Part 3
12	**Lab 12**: PID Control
13	**Lab 13**: Practical Application
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE306-S2	DIGITAL CONTROLLER	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	NA	NA	NA
Laboratory	14	2	28
Reading lectures in home	NA	NA	NA
Assignment (Homework)	2	1	2
Project Work	NA	NA	NA
Seminar	1	2	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	1	2
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	6	1	6
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	6	6
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	3	1.5	2
TOTAL WORKLOAD OF THE COURSE UNIT	**48**	**42**	**102**
Workload (h) / 25			**102÷25**
ECTS Credits allocated for the Course Unit			**4**

INFORMATION THEORY AND CODING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE401-S1	**Information Theory and Coding**	1	4	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Emad A. Mohammed**
Instructor(s) of the Course Unit	**Emad A. Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• To learn the fundamentals of information theory and the relationships between random data and the amount of information that carried. • To learn the basic techniques of coding and decoding such as source coding and channel coding
Contents of the Course Unit:	1 – probability and statistics 2 – information theory 3 – Information Channels 4 – Coding

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Review of related probability and statistics related topics
2	Random variables, continuous random variables, discrete random variables
3	Probability density function, mean, variance, standard deviation
4	Uniform distribution, Poisson distribution, Gaussian distribution
5	Model of information transmission system. Common sense definition of information. Logarithmic measure of information. Self-information.
6	Definition of information for noisy channel.. Average mutual information for noisy channel,
7	Entropy, source Entropy, Noise Entropy, Conditional Entropy
8	Types of channels, discrete memoryless channel, ideal channel, noisy channel, lossless channel
9	Channel capacity per bit, channel capacity, maximum information rate
10	Source encoding; types of code, Shannon-Fano code, Huffman code, RLE Code
11	Channel coding, error detection code, CRC, Parity check code
12	Error correction code, Hamming distance Hamming weight, Linear block code
13	Sampling theorem, Nyquist rate, linear coding, digital modulation
14	PCM , Quantization error, BER
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** probability and statistical properties
2	**Lab 2:** Random variable generation
3	**Lab 3**: PDF properties
4	**Lab 4:** Distributions transform
5	**Lab 5:** Information measurement
6	**Lab 6:** Self and Mutual information
7	**Lab 7:** types of channels
8	**Lab 8:** Channel capacity measurement
9	**Lab 9:** Shannon Fanno encoding and decoding and Huffman encoding and decoding
10	**Lab 10:** Error Detection Codes
11	**Lab 11:** Error Correction Codes
12	**Lab 12:** Sampling theorem
13	**Lab 13:** PCM
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE401-S1	INFORMATION THEORY AND CODING	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	2	4
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	14
TOTAL WORKLOAD OF THE COURSE UNIT	**86**	**62**	**175**
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

SECURITY OF COMPUTERS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE402-S1	**Security of Computer**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Najwan Z. Waisi**
Instructor(s) of the Course Unit	**Najwan Z. Waisi**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To explain the means and methods that must be followed to protect the computer from unauthorized access and tampering as well as protecting data and databases from intruders, protecting the computer network, especially private networks, from attacks by intruders Through the activation and investment of network protection protocols
Contents of the Course Unit:	1- Symmetric Ciphers model. 2- Symmetric Key Algorithms. 3- public Key Algorithms. 4- Authentication Protocols. 5- OSI security Architecture. 6- Protocols of computer networks .

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction ,Symmetric Ciphers model: plaintext, encryption algorithm, secret key, cipher text, decryption algorithm
2	A Model of conventional encryption. Cryptography, Cryptanalysis, block and stream cipher.
3	1-Caeser Cipher The affine Cipher. 2-Mono alphabetic substitution ciphers Shift ciphers.
4	Hill cipher
5	1-Playfair cipher 2-Polyalphabetic ciphers Vigenere cipher
6	1-The Transposition cipher 2-Affine cipher 3-One time pad
7	Cryptanalysis of a Symmetric key
8	Euclid's Algorithm
9	SYMMETRIC-KEY ALGORITHMS : -DES—The Data Encryption Standard, hers -16 round Feistel system
10	PUBLIC-KEY ALGORITHMS, -RSA, - Other Public-Key Algorithms
11	AUTHENTICATION PROTOCOLS, -Authentication Based on a Shared Secret Key, -Establishing a Shared Key: The Diffie -Hellman Key Exchange,
12	-Authentication Using a Key Distribution Center, -Authentication Using Kerberos, - Authentication Using Public-Key Cryptography,
13	OSI security Architecture , a model for network security, EMAIL SECURITY, -PGP—Pretty Good Privacy, S/MIME
14	PROTECTION SERVICES: •OS protection service: protected objects and methods of OS protection, security of OS, memory and addressing protection, fence protection •Database protection service. •Network protection service: IP & E-Commerce protection, VPN and next generation networks protection
15	**Final Exam**

No.	Practical Part
1	**Lab 1:** introduction to C# language .
2	**Lab 2:** oop in C#.
3	**Lab 3:** files and DLL file.
4	**Lab 4:** Caeser Cipher The affine Cipher algorithm .
5	**Lab 5:** Mono alphabetic substitution ciphers Shift ciphers algorithm .
6	**Lab 6:** Hill cipher algorithm .
7	**Lab 7:** Playfair cipher algorithm .
8	**Lab 8:** Polyalphabetic ciphers Vigenere cipher algorithm .
9	**Lab 9:** The Transposition cipher algorithm .
10	**Lab 10**: Affine cipher algorithm .
11	**Lab 11**: One time pad algorithm .
12	**Lab 12**: ERS algorithm .
13	**Lab 13**: DES algorithm .
14	**Lab 14**: Review

Workload & ECTS Credits of The Course Unit :	**BCCTE402-S1 Security of Computers**		
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

COMPUTER PROTOCOLS-1 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE403-S1	**Computer Protocols-1**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmad F. AL-Allaf**
Instructor(s) of the Course Unit	**Dr. Ahmad F. AL-Allaf**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course provides students with an understanding of the basic concepts of computer network protocols. Familiarize students with the network and transport layers protocols of the TCP/IP model. The course also helps students develop expertise in some areas of computer networking and routing, and prepares them to begin research work in this field.
Contents of the Course Unit:	1-Network architectures protocol basics. 2-OSI and TCP/IP models. 3-Network and Transport layers protocols.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	• **Protocols and Standards:** Protocols architecture, standards organizations, Internet standards and internet administrations.
2	• **OSI model and TCP/IP protocol suite:** Protocol layers, The OSI model, Layered architecture, TCP/IP Protocol suite, addressing
3	• **Underlying Technologies:** Wired local area networks and Wireless LAN
4	• **Network layer protocols:** IPv4
5	• **Network layer protocols:** IPv4 addressing
6	• **Network layer protocols:** Address resolution protocol (ARP)
7	• **Network layer protocols:** Internet control message protocol (ICMPv4)
8	• **Network layer protocols:** Unicast routing protocols (RIP, OSPF, BGP)
9	• **Network layer protocols:** Unicast routing protocols (RIP, OSPF, BGP)
10	• **Network layer protocols:** Unicast routing protocols (RIP, OSPF, BGP)
11	• **Network layer protocols:** Multicasting and multicast routing protocols
12	• **Transport layer protocols:** User datagram protocol (UDP)
13	• **Transport layer protocols:** Transmission control protocol (TCP)
14	• **Transport layer protocols:** Stream control transmission protocol (SCTP)
15	**Final Exam.**

No.	PRACTICAL PART

1	**Lab 1:** Introduction to OPNET program
2	**Lab 2:** Simulation of a LAN network
3	**Lab 3:** Configuring and Troubleshooting a LAN Network
4	**Lab 4**: IPv4 protocol
5	**Lab 5:** ARP protocol
6	**Lab 6:** ICMPv4 protocol
7	**Lab 7:** RIP protocol
8	**Lab 8:** OSPF protocol
9	**Lab 9:** BGP protocol
10	**Lab 10:** Multicasting routing protocol
11	**Lab 11:** UDP protocol
12	**Lab 12:** TCP protocol
13	**Lab 13:** SCTP protocol
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCCTE403-S1**	**COMPUTER PROTOCOLS-1**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

INTELLIGENT SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE404-S1	**Intelligent Systems**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmed Khazal Younis**
Instructor(s) of the Course Unit	**Dr. Ahmed Khazal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course aims to offer a foundation of intelligent system techniques and their application in various real-world domains and how to implement a system with "intelligent" functionality. Students will learn to judge when intelligent functionality and artificial intelligence may be a good solution for a problem and be able to choose suitable AI methods and techniques. Students will also acquire knowledge enabling them to develop necessary skills to design and implement an intelligent system.
Contents of the Course Unit:	1- Introduction and fundamentals to Artificial Intelligence System. 2- Neural Network Algorithms. 3- convolutional neural networks. 4- Fuzzy Logic Systems. 5- Genetic Algorithm.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction and fundamentals to Artificial Intelligence System:** Neural Network, Fuzzy logic, Genetic Algorithm
2	**Neural Network Architecture:** Model of artificial neuron. / Learning rules and various activation functions. Single layer Feed-forward networks. / Multilayer Feed-forward networks.
3	**Feed Forward Neural Networks algorithms:** Perceptron algorithm. / Adaptive Linear Neuron and Origins of Gradient Descent.
4	**Back propagation Algorithm:** Back Propagation network. / Architecture of Back-propagation (BP).
5	**Back propagation Algorithm:** Back-propagation Learning. / Variation of Standard Back propagation algorithms.
6	**Competitive learning:** Architectures and algorithms of competitive learning.
7	**Competitive learning:** Cluster algorithms. / Vector Quantization learning.
8	**convolutional neural networks:** fundamentals of convolutional neural networks (CNN's) Architecture.
9	**convolutional neural networks:** AlexNet convolutional neural network algorithm.
10	**convolutional neural networks:** VGG convolutional neural network algorithm.
11	**Fuzzy Logic Systems:** Basic Elements of Fuzzy Logic Systems.
12	**Fuzzy Logic Systems:** Fuzzification Methods. / Fuzzy Inference. / Defuzzification Methods. /Application Examples.
13	**Genetic Algorithm (GA):** Genetic Algorithm Basic concepts and Applications.
14	**Genetic Algorithm (GA):** Parental Choice /Discrete Recombination./Crossing Over (Binary Recombination) /Mutation, and Selection.

15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to Matlab.
2	**Lab 2:** Lab 1: Introduction to Matlab Toolbox.
3	**Lab 3**: Design and Train a Perceptron algorithm.
4	**Lab 4:** Design and Train an Adaptive Linear Neuron.
5	**Lab 5:** Design and Train a simple standard Back Propagation Algorithm
6	**Lab 6:** Design, Train, and Test a Back-propagation Algorithm
7	**Lab 7:** Design and Test a Cluster algorithm (example: SOM)
8	**Lab 8:** Design and Test a Vector Quantization learning Algorithm.
9	**Lab 9:** Design and Test AlexNet convolutional neural network algorithm.
10	**Lab 10:** Design and Test VGG convolutional neural network algorithm
11	**Lab 11:** Introduction to Fuzzy Logic Systems MAtlab Toolbox.
12	**Lab 12:** Implement Fuzzification, Fuzzy Inference , and Defuzzification Methods using Fuzzy Toolbox.
13	**Lab 13:** Introduction to GA operators: in Matlab
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCCTE404-S1**	**INTELLIGENT SYSTEMS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

MANAGEMENT Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE405-S1	**Management**	1	4	3	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Iman Najemal_deen Abdullah**
Instructor(s) of the Course Unit	**Iman Najemal_deen Abdullah**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To help students understand the basic concepts of management in general, lay the main foundations for engineering project management, analyze its result data, and make appropriate decisions based on the available information.
Contents of the Course Unit:	1- Comprehensive review of management. 2- Project Management Networks. 3- Methods to Solve Linear Programming Problems. 4- Transportation Programing. 5- Total Inventory Cost. 6- Modern Manufacturing Systems.

WEEK	KEY LEARNING OUTCOMES OF THE COURSE UNIT on successful completion of this course unit, students/learners will or will be able to dealing with:
1	Historical review of management.
2	Management Functions.
3	Project Management Networks
4	The Difference between a Manager and a Leader.
5	Critical Path Method (CPM).
6	Slack Time (ST).
7	Program Evaluation Review Technique (PERT).
8	Linear Programming Simplex Method.
9	Linear Programming Graphical Method.
10	Transporting Problems.
11	Inventory Concepts and Determine the economic order quantity
12	Maintenance Concepts.
13	Maintenance Types and Objectives.
14	Modern Manufacturing Systems.
15	Final Exam

No.	Practical Part
1	**Lab 1:** Creating a Project Plan with its details + Define Tasks
2	**Lab 2:** Network Drawing / Determining a Total Time.
3	**Lab 3:** Network Drawing / Determining: Early Stop (ES), Late Stop (LS), Slack Time (ST), Critical Path (CP)
4	**Lab 4:** Table Method / Determining: Early Stop (ES), Late Stop (LS), Slack Time (ST), Critical Path (CP)
5	**Lab 5:** PERT / Finding Expected Time.
6	**Lab 6:** Linear Programming / Simplex Method.
7	**Lab 7:** Linear Programming / Graphical Method.
8	**Lab 8:** Transporting Problems / North - West corner Method.
9	**Lab 9:** Transporting Problems / Less Cost (LC) Method.
10	**Lab 10:** Transporting Problems / stepping stone (SS) Method.
11	**Lab 11:** Inventory Mathematical Exercises.
12	**Lab 12:** Making a schedule by the student to carry out maintenance in the computer unit in a factory.

Workload & ECTS Credits of The Course UNIT:	**BCCTE405-S1**	**Management**	
Workload For Learning & Teaching Activities			
Type of the Learning Activities	**Learning Activities (# of week)**	**Duration (hours, h)**	**Workload (h)**
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	2	1	2
Laboratory	13	2	26
Reading	NA	NA	NA
Assignment (Homework)	3	1	3
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	1	2
Final Exam	1	3	3
Preparation for the Final Exam	1	1	1
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	1	1
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	2	1.5	3
Total Workload of the Course Unit	**45**	**16**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

PROJECT1 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE406-S1	Project1	1	2	1	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Students of the Computer Engineering Department gain experience in basic design in their last year of study through the graduation project. Students can work anywhere in teams ranging in number from three to five students, with an average of three students per team. In addition, students are allowed to form their teams and select their graduation projects, which must be approved by the academic staff member who delivers the course. The main purpose of the project graduation course is to encourage the students to apply the knowledge they have acquired during their study. The projects need to integrate engineering criteria and realistic constraints, such as economic, environmental, moral, security, social, political, and sustainability-related considerations.
Contents of the Course Unit:	1- Project Selection and Proposal 2- Literature Review and Background Research 3- Project Planning and Design 4- Prototyping and Experimental Work

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students will dealing with:
1,2	**Project Selection and Proposal** • Introduction to project selection criteria and guidelines • Identifying a research problem or engineering challenge in biomedical engineering • Formulating a project proposal with clear objectives and scope
3,4,5	**Literature Review and Background Research** • Conducting a comprehensive literature review on the chosen project topic • Evaluating existing research and technologies relevant to the project • Analyzing and synthesizing information to inform the project design
6,7,8,9	**Project Planning and Design** • Developing a detailed project plan with milestones and timelines • Defining project requirements and specifications • Conceptualizing and designing solutions to address the identified problem or challenge
10,11,12,13,14	**Prototyping and Experimental Work** • Building prototypes or designing experiments to test and validate the proposed solution • Acquiring and assembling necessary components or materials for the project • Conducting experiments, data collection, and measurements as required

No.	PRACTICAL PART
	This part varies depending on the subject of the project which is differ from group to group

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE406-S1	PROJECT1	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	5	2	10
Reading	5	1	5
Assignment (Homework)	2	1	2
Project Work	2	2	4
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	1	1	1
Web Based Learning	3	1	3
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	3	1	3
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	1	5	5
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	5	5
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	NA	NA	NA
Preparation for the Short Exam	NA	NA	NA
TOTAL WORKLOAD OF THE COURSE UNIT	**35**	**32**	**58**
Workload (h) / 25			**58÷25**
ECTS Credits allocated for the Course Unit			**2.32**

WIRELESS COMMUNICATION Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE401-S2	**Wireless Communication**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Hakam Marwan Zaidan**
Instructor(s) of the Course Unit	**Hakam Marwan Zaidan**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To provide students with a comprehensive understanding of wireless communication systems and technologies. The course aims to cover topics such as wireless channel characteristics, modulation techniques, multiple access schemes, wireless network architectures, and protocols. By the end of the course, students should be able to analyze and design wireless communication systems, understand the challenges and constraints specific to wireless environments, and make informed decisions regarding the selection and optimization of wireless communication technologies. The course also focuses on practical applications and hands-on experience through projects and simulations. Overall, the course aims to equip students with the knowledge and skills necessary for successful design and implementation of wireless communication solutions.
Contents of the Course Unit:	1- Introduction to wireless communication 2- The cellular concept-system design fundamentals. 3- Traffic engineering. 4- Pathloss models and multipath propagation. 5- Multiple access techniques. 6- Emerging wireless technologies.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to wireless communication systems:** Evolution of mobile communication, mobile radio around the world, 2G, 3G, G4 systems
2	**The cellular concept-system design fundamentals:** Cellular systems, hexagonal cell geometrey,
3	**The cellular concept-system design fundamentals:** Frequency reuse and cell splitting concept.
4	**The cellular concept-system design fundamentals:** S/I ratio consideration, handoff strategies.
5	**Traffic engineering:** Trunking and grade of service
6	**Pathloss models:** Free space propagation model.
7	**Pathloss models:** Reflection, ray ground propagation models.
8	**Pathloss models:** LOS, NLOS systems
9	**Pathloss models:** Rayleigh and rician distribution.
10	**Multiple access techniques:** TDMA, FDMA, CDMA**.**
11	**Mobile handoff strategies.**
12	**Mobile calls and data rerouting strategies.**
13	**GSM system.**
14	**Recent trends**: WiFi, Bluetooth, ZigBee protocols.
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to MATLAB Programming environment.
2	**Lab 2:** free space pathloss model.
3	**Lab 3**: CCIR (ITU-R) Pathloss Model
4	**Lab 4:** Hata pathloss Model
5	**Lab 5:** pathloss models (comparison)
6	**Lab 6:** Rayleigh distribution
7	**Lab 7:** Rician distribution
8	**Lab 8:** DS_CDMA simulation
9	**Lab 9:** HC-06 Bluetoth Module with Arduino (controlling house hold devices)
10	**Lab 10:** HC-06 Bluetoth Module with Arduino (MIT App Inventor for Android applications)
11	**Lab 11:** Zigbee protocol represented by XBee module (stand laone)
12	**Lab 12:** Zigbee protocol represented by XBee module with Arduino Microcontroller.
13	**Lab 13:** Zigbee protocol represented by XBee module, digital and analogue I/O.
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit : BCCTE401-S2 **WIRELESS COMMUNICATION**			
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

ADVANCED DIGITAL ELECTRONICS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE402-S2	**Advanced Digital Electronics**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Basma MohammedKamal Younis**
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The objectives of the VHDL (Very High-Speed Integrated Circuit Hardware Description Language) course unit typically include: 1. Understanding the fundamentals of VHDL as a hardware description language. 2. Gaining proficiency in writing VHDL code for designing digital systems. 3. Learning the syntax, data types, and constructs of VHDL. 4. Acquiring knowledge of VHDL simulation and synthesis techniques. 5. Developing skills in designing and testing digital circuits using VHDL. 6. Applying VHDL in the design, verification, and implementation of digital systems.
Contents of the Course Unit:	Part-1 **VHDL**: Basic design units, Modeling and data types, Operators and Attributes, Concurrent and Sequential code, Packages, components, Functions and procedures Part-2 **FPGAs**: Introduction, Programming technologies, Building Blocks, Programmable Logic, and FPGA Architecture.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Main Features of VHDL:** Fundamental VHDL Design Units: (Library, Entity and Architecture) Modeling Types: (Structural, Data Flow, Behavioral and Mixed Style Modeling)
2	**VHDL Data types,** Pre-defined data type and User-defined data types
3	**Operators and Attributes:** Assignment, Logical , Arithmetic, Relational, Shift and Concatenation operators Data, Signal and User defined attributes
4	**Concurrent code:** Concurrent versus Sequential, When, Generate and Block
5	**Sequential code:** Process, If, Wait, Case and Loop
6	**Packages and components**
7	**Functions and procedures**
8	**VHDL Simulation, VHDL Synthesis.Design examples**
9	**Introduction to FPGA:** What are FPGAs? What can FPGAs used for? FPGA Design flow. Manufacturers(Xilinx and Altera)
10	**Programming technologies:** Fusible,Anti-fuse, PROMs, EPROM-based, EEPROM-based ,FLASH-based and SRAM-based technologies.
11	**Basic Building Blocks** Random-Access Memory (RAM), Read-only memory (ROM), Programmable ROMs. Multiplexers, decoders … etc.

12	**Programmable Logic** PAL, PLA, GAL,SPLDs and CPLDs, Altera CPLDs, Xilinx CPLDs. Macrocells.
13	**FPGA Architecture:** Configurable logic block, Configurable I/O standards and Programmable Interconnection
14	**FPGA Architecture:** Additional features: Embedded RAMs, Embedded multipliers, MACs, Clock managers... etc.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to VIVADO Development Software: ***Design Examples*** *AND,OR and XOR logic gates*
2	**Lab 2:** Design Using Xilinx ZED board FPGA starter kit*:* ***Design Example*** *full-adder*
3	**Lab 3**: Fundamental VHDL Units (LIBRARY, ENTITY and ARCHITECTURE):***Design Example*** *Decoder*
4	**Lab 4:** Data Types in VHDL language*:* ***Design Example****s Multiplexer , De Multiplexer*
5	**Lab 5:** Operators and Attributes*:* ***Design Example*** *Parity Generator*
6	**Lab 6:** Concurrent Code: ***Design Example*** *Comparator*
7	**Lab 7:** Sequential Code1**:** ***Design Example*** *2-digit counter*
8	**Lab 8:** Sequential Code2: ***Design Example*** *DFF*
9	**Lab 9:** Signals and Variables*:* ***Design Example*** *Count Ones circuit and Intensity Encoder*
10	**Lab 10:** Components*:* ***Design Example*** *4-bit Serial-in/Parallel-out shift register*
11	**Lab 11:** Library part1 Packages: ***Design Example*** *ALU Design*
12	**Lab 12:** Library part2 Functions and Procedures: ***Design Example*** *Signed Multiplier*
13	**Lab 13:** Frequency Divider*:* ***Design Example*** *BCD counter*
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE402-S2	ADVANCED DIGITAL ELECTRONICS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2

Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

COMPUTER PROTOCOLS-2 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE403-S2	**Computer Protocols-2**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmad F. AL-Allaf**
Instructor(s) of the Course Unit	**Dr. Ahmad F. AL-Allaf**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course provides students with an understanding of the basic concepts of computer network protocols. Familiarize students with the protocols for application, physical and data link layers of the TCP/IP model and the security in the internet. The course also helps students develop expertise in some areas of computer networking and routing, and prepares them to begin research work in this field.
Contents of the Course Unit:	1- TCP/IP Application layer protocols. 2- Data link and physical layers protocols. 3- Next generation protocols 4- Internet security

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	• **Application layer protocols:** Host configuration: DHCP protocol.
2	• **Application layer protocols:** Domain name system (DNS) protocol.
3	• **Application layer protocols:** Remote login: TELNET and SSH protocols.
4	• **Application layer protocols:** File transfer: FTP and TFTP protocols
5	• **Application layer protocols:** World Wide Web and HTTP protocol
6	• **Application layer protocols:** Electronic Mail: SMTP, POP, IMAP, and MIME protocols
7	• **Application layer protocols:** Network Management: SNMP protocol
8	• **Data link protocol:** Logical link control (LLC) protocol
9	• **Data link protocol:** Point to point (PPP) protocol
10	• **Physical layer protocols:** Ethernet protocol
11	• **Physical layer protocols:** Bluetooth, PON, OTN, DSL,
12	• **Physical layer protocols** IEEE. 802.11, IEEE. 802.3
13	• **Next Generation protocols:** IPv6 protocol and ICMPv4
14	• **Internet Security:** Network layer, transport and application layer security.
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** DHCP protocol using OPNET program
2	**Lab 2:** DNS protocol
3	**Lab 3**: TELNET protocol
4	**Lab 4:** FTP protocol
5	**Lab 5:** HTTP protocol
6	**Lab 6:** Electronic mail protocols
7	**Lab 7:** SNMP protocol
8	**Lab 8:** PPP protocol
9	**Lab 9:** Ethernet
10	**Lab 10:** Bluetooth
11	**Lab 11:** IEEE 802.11
12	**Lab 12:** IPv6
13	**Lab 13:** security protocols
14	**Lab 14:** Review

Workload & ECTS Credits of The Course Unit :	**BCCTE403-S2**	**Computer Protocols-2**	
Workload For Learning & Teaching Activities			
Type of the Learning Activites	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

CLOUD COMPUTING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE404-S2	**Cloud Computing**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Core**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Anmar Burhan Mohammed Salih**
Instructor(s) of the Course Unit	**Dr. Anmar Burhan Mohammed Salih**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To provide students with hands-on experience and practical skills to understand the theoretical parts of Cloud Computing.
Contents of the Course Unit:	1- Understanding Cloud Computing: 2- Familiarity with Cloud Service Models: 3- Knowledge of Cloud Deployment Models: 4- Proficiency in Cloud Infrastructure: 5- Hands-on Experience with Cloud Platforms: 6- Understanding Cloud Security. 7- Cloud Migration and Management: 8- Awareness of Emerging Trends: 9- Problem-Solving and Critical Thinking

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to Cloud Computing • Overview of cloud computing concepts and architecture • Different cloud service models (IaaS, PaaS, SaaS) • Cloud deployment models (public, private, hybrid)
2	Virtualization Technologies • Introduction to virtualization and its role in cloud computing • Virtualization platforms (VMware, Xen, KVM) • Managing virtual machines and containers
3	Cloud Storage • Introduction to cloud storage services (Amazon S3, Google Cloud Storage) • Object storage and block storage • Data replication and backup strategies in the cloud
4	Cloud Networking • Basics of cloud networking and virtual private networks (VPNs) • Network security in the cloud • Load balancing and content delivery networks (CDNs)
5	Cloud Security • Security challenges and considerations in cloud computing • Identity and access management (IAM) in the cloud • Data encryption and key management
6	Cloud Computing Platforms • Overview of major cloud platforms (Amazon Web Services, Microsoft Azure, Google Cloud Platform) • Deploying applications on cloud platforms • Platform-as-a-Service (PaaS) offerings
7	Serverless Computing • Introduction to serverless computing • Function-as-a-Service (FaaS) platforms (AWS Lambda, Azure Functions) • Developing and deploying serverless applications
8	• Midterm exam
9	Cloud Database Management

	• Database options in the cloud (SQL and NoSQL) • Cloud database services (Amazon RDS, Azure Cosmos DB) • Data warehousing and analytics in the cloud
10	DevOps in the Cloud • Continuous integration and continuous deployment (CI/CD) pipelines • Infrastructure as Code (IaC) with tools like Terraform and CloudFormation • Monitoring and logging in the cloud
11	Cloud Migration Strategies • Planning and executing cloud migration projects • Lift-and-shift, re-platforming, and refactoring approaches • Challenges and considerations in cloud migration
12	Hybrid and Multi-cloud Environments • Hybrid cloud architectures and integration strategies • Managing multiple cloud providers and workloads • Cloud cost optimization and governance
13	Cloud Scalability and High Availability • Scaling applications in the cloud • Auto-scaling and load balancing techniques • High availability and fault tolerance in the cloud
14	Cloud Cost Management • Cost models and pricing structures in the cloud • Monitoring and optimizing cloud costs • Rightsizing and resource allocation strategies
15	Final Exam

No.	PRACTICAL PART
1	**Lab 1:** Introduction to Cloud Platforms • Setting up accounts on major cloud platforms (e.g., AWS, Azure, GCP) • Navigating the cloud platform interfaces • Deploying a basic virtual machine instance
2	**Lab 2:** Virtualization and Containerization • Creating and managing virtual machines using hypervisors (e.g., VirtualBox) • Exploring containerization with Docker • Building and running containers locally
3	**Lab 3:** Cloud Storage • Setting up and configuring cloud storage services (e.g., Amazon S3, Azure Blob Storage) • Uploading and downloading files from cloud storage • Implementing data replication and backup strategies
4	**Lab 4:** Networking in the Cloud • Configuring virtual networks and subnets • Creating security groups and access control rules • Establishing VPN connections between on-premises and cloud environments
5	**Lab 5:** Serverless Computing • Deploying serverless functions using AWS Lambda or Azure Functions • Integrating serverless functions with other cloud services (e.g., S3, API Gateway) • Monitoring and troubleshooting serverless applications.
6	**Lab 6:** Cloud Database Management • Creating and managing relational databases (e.g., Amazon RDS, Azure SQL Database) • Exploring NoSQL databases (e.g., DynamoDB, Cosmos DB) • Performing data backups and restores
7	**Lab 7:** Infrastructure as Code • Introduction to Infrastructure as Code (IaC) tools like Terraform or AWS CloudFormation • Writing IaC templates to provision cloud resources • Automating resource deployment and updates
8	**Lab 8:** Midterm
9	**Lab 9:** Cloud Security and Identity Management • Configuring identity and access management (IAM) policies • Implementing multi-factor authentication (MFA) for cloud accounts • Enforcing security best practices and monitoring for security breaches

10	**Lab 10**: Load Balancing and Auto Scaling • Configuring load balancers for distributing traffic (e.g., AWS ELB, Azure Load Balancer) • Setting up auto scaling to dynamically adjust resources based on demand • Testing load balancing and auto scaling scenarios
11	**Lab 11**: Continuous Integration and Deployment (CI/CD) • Implementing a CI/CD pipeline using tools like Jenkins or AWS CodePipeline • Automating the build, test, and deployment of cloud-based applications • Integrating version control systems (e.g., Git) with CI/CD processes
12	**Lab 12**: Cloud Monitoring and Logging • Implementing monitoring and logging services (e.g., AWS CloudWatch, Azure Monitor) • Configuring alerts and notifications for resource monitoring • Analyzing logs and performance metrics for troubleshooting
13	**Lab 13**: Cloud Cost Optimization • Monitoring and analyzing cloud costs using cost management tools (e.g., AWS Cost Explorer, Azure Cost Management) • Implementing cost optimization techniques (e.g., rightsizing, scheduling) • Estimating and optimizing cloud resource usage for cost-efficiency
14	**Lab 14**: Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCCTE404-S2**	**CLOUD COMPUTING**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	2	1	2
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading lectures in home	12	2	24
Assignment (Homework)	2	2	4
Project Work	NA	NA	NA
Seminar	1	3	1
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	2	2	4
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	10	10
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	8	8
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	2	1	2
TOTAL WORKLOAD OF THE COURSE UNIT	**61**	**41.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

MULTIMEDIA COMPUTING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE405-S2	**Multimedia Computing**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Fadwa S. Mustafa**
Instructor(s) of the Course Unit	**Dr. Fadwa S. Mustafa**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• Clarifying the concept of multimedia computing, explaining its applications and components
Contents of the Course Unit:	1 – Introduction to Multimedia and Applications. 2 – Graphic and Image Data Representation. 3 – Images Digitization. 4 – Fundamental concepts in Video. 5 – Sound and Audio Basics.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to deal with:
1	**1- WHAT IS MULTIMEDIA?** Explaining the idea of multimedia, defining its applications that use multiple modalities to their advantage, including text, images, drawings (graphics), animation, video, and sound (including speech).
2	**2- Hypermedia and Hypertext Definitions and Applications** HTTP, URI, HTML, and XML Protocol.
3	**3- Graphics and Image Data Representations** The specifics of file formats for storing such images will also be discussed for graphics/image data types and Popular file formats
4	**4- Image Digitization** Digitization process to become suitable for digital processing, an image function f(x,y) must be digitized both spatially and in amplitude.
5	**5- Image Algebra.** Arithmetic and Logical Operations on Images.
6	**6- Image Histogram.** Histogram Modification and Histogram Equalization.
7	**7-Image Filters Techniques.** Spatial Domain and Frequency Domain.
8	**8- Image Segmentation.** Edge Segmentation, Region Segmentation, Point Detection, and Line Detection.
9	**9- Losses Compression Algorithms.** Run Length Encoding, Huffman encoding, Shannon Fano encoding, Arithmetic encoding, Lempel Ziv Welch encoding.
10	**10- Lossy Compression Algorithms.** Lossy compression algorithms are techniques that reduce the file size by discarding the less important information.
11	**11- Image Compression Standards** The JPEG standard specifies the codec.
12	**12- Fundamental Concept in Video** Component video, Visual Representation.
13	**13- Types of Video Signals.** Analog Video, Digital Video.
14	**14- Basics of Digital Audio.** A digital-to-analog converter, Digital Audio File Format.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Hypertext and Hypermedia Application by using PowerPoint software.
2	**Lab 2:** Starting with the MATLAB program.
3	**Lab 3:** Basics of image processing (Import, Processing, and Export).
4	**Lab 4:** Image Conversion part1.
5	**Lab 5:** Image Conversion Part 2.
6	**Lab 6:** Rotating and cropping of images .
7	**Lab 7:** Separate Color Channels (Red, Green, and Blue) from RGB images.
8	**Lab 8:** Arithmetic Operations on Image Matrix.
9	**Lab 9:** Image Enhancement Point processing techniques (a histogram equalization technique).
10	**Lab 10:** Frequency domain techniques (filtering) with (filter2).
11	**Lab 11:** Filtering with im-filter.
12	**Lab 12:** Image Enhancement (Average filter).
13	**Lab 13:** Low-Frequency Filters on Image (Gaussian Filter).
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT:	BCCTE405-S2	MULTIMEDIA COMPUTING	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVATES	LEARNING ACTIVITIES (# OF THE WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	4	1	4
Assignment (Homework)	2	1	2
Project Work	1	3	3
Seminar	4	1	4
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	5	5
Implementation/Application/Practice	2	2	4
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	15	15
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**58**	**54**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

PROJECT2 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCCTE406-S2	Project2	2	2	1	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Students of the Computer Engineering Department gain experience in basic design in their last year of study through the graduation project. Students can work anywhere in teams ranging in number from three to five students, with an average of three students per team. In addition, students are allowed to form their teams and select their graduation projects, which must be approved by the academic staff member who delivers the course. The main purpose of the project graduation course is to encourage the students to apply the knowledge they have acquired during their study. The projects need to integrate engineering criteria and realistic constraints, such as economic, environmental, moral, security, social, political, and sustainability-related considerations.
Contents of the Course Unit:	1- Experimental Work 2- Data Analysis and Interpretation 3- Documentation and Reporting 4- Presentation and Demonstration 5- Project Evaluation and Reflection

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students will dealing with:
1,2,3	**Experimental Work** • Conducting experiments, data collection, and measurements as required
4,5,6	**Data Analysis and Interpretation** • Analyzing experimental or collected data using appropriate statistical or analytical methods • Interpreting and drawing conclusions from the data • Iterating and refining the project design based on data analysis results
7,8,9	**Documentation and Reporting** • Documenting the project progress, including design decisions, experimental setups, and results • Writing technical reports or project documentation • Creating visual aids (e.g., diagrams, graphs, charts) to effectively communicate the project findings
10,11,12	**Presentation and Demonstration** • Preparing and delivering a final project presentation to an audience of peers, instructors, or industry professionals • Demonstrating the project functionality, experimental setup, or design outcomes • Addressing questions and feedback from the audience
13,14,15	**Project Evaluation and Reflection** • Conducting self-evaluation and reflection on the project outcomes, strengths, and areas for improvement • Participating in project evaluation sessions with instructors or evaluators • Providing constructive feedback to peers on their projects

No.	PRACTICAL PART
	This part varies depending on the subject of the project which is differ from group to group

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCCTE406-S1	PROJECT1	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	5	2	10
Reading	5	1	5
Assignment (Homework)	2	1	2
Project Work	2	2	4
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	1	1	1
Web Based Learning	3	1	3
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	3	1	3
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	1	5	5
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	5	5
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	NA	NA	NA
Preparation for the Short Exam	NA	NA	NA
TOTAL WORKLOAD OF THE COURSE UNIT	**35**	**32**	**58**
Workload (h) / 25			**58÷25**
ECTS Credits allocated for the Course Unit			**2.32**

HARDWARE DESCRIPTION LANGUAGE Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS(T+P)	CREDIT	ECTS CREDIT
BCETE401-S1	**Hardware Description Language**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Basma MohammedKamal Younis**
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The objectives of the VHDL (Very High-Speed Integrated Circuit Hardware Description Language) course unit typically include: 1-Understanding the fundamentals of VHDL as a hardware description language. 2-Gaining proficiency in writing VHDL code for designing digital systems. 3-Learning the syntax, data types, and constructs of VHDL. 4-Acquiring knowledge of VHDL simulation and synthesis techniques. 5-Developing skills in designing and testing digital circuits using VHDL. 6-Applying VHDL in the design, verification, and implementation of digital systems.
Contents of the Course Unit:	1- Basic design units 2- Modeling and data types 3- Operators and Attributes 4- Concurrent and Sequential code 5- Packages, components, Functions and procedures 6- Implementation of FSM using VHDL

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Modeling Types:** Structural, Data Flow, Behavioral and Mixed Style Modeling
2	**Data types:** pre-defined data type
3	**Data types:** user-defined data types
4	**Operators:** Assignment, Logical , Arithmetic, Relational, Shift and Concatenation operators
5	**Attributes :** Data, Signal and User defined attributes
6	**Objects:** Constant, Signal, Variable
7	**Concurrent code:** Concurrent versus Sequential, When, Generate and Block
8	**Sequential code:** Process, If, Wait, Case and Loop
9	**State machine:** Design Styles, Moore and Mealy machines, Encoding Style
10	**Packages**
11	**Components**
12	**Functions and procedures**

13	**VHDL Simulation, VHDL Synthesis.**
14	**Design examples**
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to VIVADO Software**: *Design Examples*** *AND,OR and XOR logic gates*
2	**Lab 2:** Design Using Xilinx ZED board FPGA kit***: Design Example*** *full-adder*
3	**Lab 3**: Fundamental VHDL Units (LIBRARY, ENTITY and ARCHITECTURE): ***Design Example*** *Decoder*
4	**Lab 4:** Data Types in VHDL language part1***: Design Example*** *Multiplexer*
5	**Lab 5:** Data Types in VHDL language part2***: Design Example*** *De Multiplexer*
6	**Lab 6:** Operators and Attributes***: Design Example*** *Parity Generator*
7	**Lab 7:** Concurrent Code***: Design Example*** *Comparator*
8	**Lab 8:** Sequential Code1: ***Design Example*** *2-digit counter*
9	**Lab 9:** Sequential Code2***: Design Example*** *DFF*
10	**Lab 10:** Signals and Variables***: Design Example*** *Count Ones circuit and Intensity Encoder*
11	**Lab 11:** Components***: Design Example*** *4-bit Serial-in/Parallel-out shift register*
12	**Lab 12:** Library part1 Packages***: Design Example*** *ALU Design*
13	**Lab 13:** Library part2 Functions and Procedures: ***Design Example*** *Signed Multiplier*
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE401-S1 **HARDWARE DESCRIPTION LANGUAGE**		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12

Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

ADVANCED COMPUTER TECHNOLOGY Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE 402-S1	**Advanced Computer Technology**	1	4	3	7

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Orjuwan Mohammed Abduljawad Al-Jawadi**
Instructor(s) of the Course Unit	**Orjuwan Mohammed Abduljawad Al-Jawadi**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the student to the study of the advanced internal architecture of the microprocessor modes, addressing, and hardware organization of memory management, protective mode, cache memory and pipelining techniques.
Contents of the Course Unit:	1- Internal Organizations of Microprocessor units 2- Modes of Operating Systems 3- Memory Management System 4- Cache Mechanism types, design 5- Parallel Processing 6- Intel's' Pentium and Core Processing

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Internal Organization of 80386DX microprocessor's functional units
2	Real Mode and Protected modes of 80386DX
3	Program Invisible Registers
4	Selectors and Descriptors Tables and Registers: GTD, LTD and ITD
5	Paging Unit and Memory Management System
6	Paging Mechanism and Physical Addresses Translation
7	TLB (Translation Lookaside Buffer) Examples
8	Cache Memory Mechanism: Fully Associative, Direct Mapping Introduction, design and examples
9	Designing Set Associative Cache Memory: using different number of data and addresses sets
10	Parallel Processing and Data Transfer Modes in Computer System
11	Pipelining Design Techniques: Bus States and Pipelined and Non-Pipelined Bus Cycles
12	Vector (Array) Processing and Superscalar Processors
13	Intel's Pentium Microprocessor Introduction: Features of the Pentium
14	Intel Overdrive Technology: Pentium Pro Architecture, Pentium Pro – Out of Order Execution, Pentium Processor Examples, Core Processor Architecture and types
15	**Final Exam**

No.	PRACTICAL PART
1	**Lab 1: Introduction to EMU8086 / Memory Access**
2	**Lab 2: Displaying Character on Screen using Variables and Directives**
3	**Lab 3: BOIS Interrupts**
4	**Lab 4: Far Call Interrupt**
5	**Lab 5: Programming the Microprocessor and Drawing using Common Functions**
6	**Lab 6: Programming the Microprocessor using Procedures**
7	**Lab 7: Strings and Colors Attributes using Bios Interrupts**
8	**Lab 8: Converting Between Temperatures Degrees System**
9	**Lab 9: Designing Comparison System using Emu8086**
10	**Lab 10: Designing Thermometer System using Emu8086**
11	**Lab 11: Designing Traffic Light System using Emu8086**
12	**Lab 12: Designing Timer with Electronic LED Screen**
13	**Lab 13: Designing Stepper Motor using Emu8086**
14	**Lab 14: Programing Robot**

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT:	**BCETE 402-S1** ADVANCED COMPUTER TECHNOLOGY		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITIES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	4	2	8
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	14	2	28
Reading	2	3	6
Assignment (Homework)	8	1	8
Project Work	1	3	3
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	1	5	5
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	8	2	16
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	8	0.5	4
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**86**	**63**	**175**
Workload (h) / 25			**175÷25**
ECTS Credits allocated for the Course Unit			**7**

COMPUTER NETWORKS FUNDAMENTALS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE403-S1	**Computer Networks Fundamentals**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ziyad Khalaf Farej**
Instructor(s) of the Course Unit	**Dr. Ziyad Khalaf Farej**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	**The objectives of computer networks fundamentals are to provide students with a solid foundation in networking concepts, protocols, technologies, and practices, enabling them to understand, design, implement, and troubleshoot computer networks effectively.**
Contents of the Course Unit:	1- Introduction to data communication and networks 2- Network Models 3- LANs Topologies 4- Digital signals transmission 5- Multiplexing and Demultiplexing 6- Switching 7- Wired LANs

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to data communication and networks:** Data Representations, Data Flows, and classify the computer networks according to application, size, transmission technology
2	**Network Models:** Protocol Layering, The ISO reference Model, and TCP/IP Reference Model
3	Connection-Oriented Versus Connectionless Service, and Service Primitives
4	**LANs Topologies:** CSMA/CD, Token Access protocols, and IP addressing
5	Metropolitan Area Networks, Wide Area Networks, Internetworks, and VPNs
6	performance metrics, Bandwidth, Throughput, Latency (Delay),Bandwidth-Delay, Jitter
7	**Digital signals transmission:** impairment (attenuation, distortion, noise, data rate limits) Channel capacity and Shannon Formula
8	Bandwidth-Limited Signals, The Maximum Data Rate of a Channel
9	Guided transmission media (twisted-pair cable, coaxial cable, fiber-optic cable), and wireless transmission, transmission modes, Parallel and Serial Transmissions
10	**Digital Signals and Digital Transmission:** Line Coding Baseband, Passband,
11	**Multiplexing and Demultiplexing:** FDM,TDM, and CDM
12	Public Switched Telephone Network: Structure of the Telephone System, DSL Trunks and Multiplexing
13	**Switching:** Circuit and Datagram Networks, Virtual-Circuit Networks Circuit switching, packet switching & virtual switching
14	**Wired LANs:** Ethernet Standards, Bridged Ethernet, Switched Ethernet, Fast Ethernet And Gigabit Ethernet
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to Network Lab
2	**Lab 2:** Network Transmission media
3	**Lab 3**: Cables and LAN tester
4	**Lab 4:** Network Devices 1
5	**Lab 5:** Network Devices 2
6	**Lab 6:** Peer-to-peer Network
7	**Lab 7:** Building LAN Network using Hub 1
8	**Lab 8:** Building LAN Network using Hub 2
9	**Lab 9:** Network Tools
10	**Lab 10:** Network commands 1
11	**Lab 11:** Network commands 2
12	**Lab 12:** Introduction to Internet Protocol (IP)
13	**Lab 13:** IP addressing 1
14	**Lab 14:** IP addressing 2

Workload & ECTS Credits of The Course Unit :	**BCETE403-S1 Computer Networks Fundamentals**		
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

INTELLIGENT SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE404-S1	**Intelligent Systems**	1	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmed Khazal Younis**
Instructor(s) of the Course Unit	**Dr. Ahmed Khazal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course aims to offer a foundation of intelligent system techniques and their application in various real-world domains and how to implement a system with "intelligent" functionality. Students will learn to judge when intelligent functionality and artificial intelligence may be a good solution for a problem and be able to choose suitable AI methods and techniques. Students will also acquire knowledge enabling them to develop necessary skills to design and implement an intelligent system.
Contents of the Course Unit:	1- Introduction and fundamentals to Artificial Intelligence System. 2- Neural Network Algorithms. 3- convolutional neural networks. 4- Fuzzy Logic Systems. 5- Genetic Algorithm.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction and fundamentals to Artificial Intelligence System:** Neural Network, Fuzzy logic, Genetic Algorithm
2	**Neural Network Architecture:** Model of artificial neuron. / Learning rules and various activation functions. Single layer Feed-forward networks. / Multilayer Feed-forward networks.
3	**Feed Forward Neural Networks algorithms:** Perceptron algorithm. / Adaptive Linear Neuron and Origins of Gradient Descent.
4	**Back propagation Algorithm:** Back Propagation network. / Architecture of Back-propagation (BP).
5	**Back propagation Algorithm:** Back-propagation Learning. / Variation of Standard Back propagation algorithms.
6	**Competitive learning:** Architectures and algorithms of competitive learning.
7	**Competitive learning:** Cluster algorithms. / Vector Quantization learning.
8	**convolutional neural networks:** fundamentals of convolutional neural networks (CNN's) Architecture.
9	**convolutional neural networks:** AlexNet convolutional neural network algorithm.
10	**convolutional neural networks:** VGG convolutional neural network algorithm.
11	**Fuzzy Logic Systems:** Basic Elements of Fuzzy Logic Systems.
12	**Fuzzy Logic Systems:** Fuzzification Methods. / Fuzzy Inference. / Defuzzification Methods. /Application Examples.
13	**Genetic Algorithm (GA):** Genetic Algorithm Basic concepts and Applications.
14	**Genetic Algorithm (GA):** Parental Choice /Discrete Recombination./Crossing Over (Binary Recombination) /Mutation, and Selection.

15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to Matlab.
2	**Lab 2:** Lab 1: Introduction to Matlab Toolbox.
3	**Lab 3**: Design and Train a Perceptron algorithm.
4	**Lab 4:** Design and Train an Adaptive Linear Neuron.
5	**Lab 5:** Design and Train a simple standard Back Propagation Algorithm
6	**Lab 6:** Design, Train, and Test a Back-propagation Algorithm
7	**Lab 7:** Design and Test a Cluster algorithm (example: SOM)
8	**Lab 8:** Design and Test a Vector Quantization learning Algorithm.
9	**Lab 9:** Design and Test AlexNet convolutional neural network algorithm.
10	**Lab 10:** Design and Test VGG convolutional neural network algorithm
11	**Lab 11:** Introduction to Fuzzy Logic Systems MAtlab Toolbox.
12	**Lab 12:** Implement Fuzzification, Fuzzy Inference , and Defuzzification Methods using Fuzzy Toolbox.
13	**Lab 13:** Introduction to GA operators: in Matlab
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCETE404-S1**	**INTELLIGENT SYSTEMS**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

MANAGEMENT Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE405-S1	**Management**	1	4	3	3

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Iman Najemal_deen Abdullah**
Instructor(s) of the Course Unit	**Iman Najemal_deen Abdullah**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	To help students understand the basic concepts of management in general, lay the main foundations for engineering project management, analyze its result data, and make appropriate decisions based on the available information.
Contents of the Course Unit:	1- Comprehensive review of management. 2- Project Management Networks. 3- Methods to Solve Linear Programming Problems. 4- Transportation Programing. 5- Total Inventory Cost. 6- Modern Manufacturing Systems.

WEEK	KEY LEARNING OUTCOMES OF THE COURSE UNIT on successful completion of this course unit, students/learners will or will be able to dealing with:
1	Historical review of management.
2	Management Functions.
3	Project Management Networks
4	The Difference between a Manager and a Leader.
5	Critical Path Method (CPM).
6	Slack Time (ST).
7	Program Evaluation Review Technique (PERT).
8	Linear Programming Simplex Method.
9	Linear Programming Graphical Method.
10	Transporting Problems.
11	Inventory Concepts and Determine the economic order quantity
12	Maintenance Concepts.
13	Maintenance Types and Objectives.
14	Modern Manufacturing Systems.
15	Final Exam

No.	Practical Part
1	**Lab 1:** Creating a Project Plan with its details + Define Tasks
2	**Lab 2:** Network Drawing / Determining a Total Time.
3	**Lab 3:** Network Drawing / Determining: Early Stop (ES), Late Stop (LS), Slack Time (ST), Critical Path (CP)
4	**Lab 4:** Table Method / Determining: Early Stop (ES), Late Stop (LS), Slack Time (ST), Critical Path (CP)
5	**Lab 5:** PERT / Finding Expected Time.
6	**Lab 6:** Linear Programming / Simplex Method.
7	**Lab 7:** Linear Programming / Graphical Method.
8	**Lab 8:** Transporting Problems / North - West corner Method.
9	**Lab 9:** Transporting Problems / Less Cost (LC) Method.
10	**Lab 10:** Transporting Problems / stepping stone (SS) Method.
11	**Lab 11:** Inventory Mathematical Exercises.
12	**Lab 12:** Making a schedule by the student to carry out maintenance in the computer unit in a factory.

Workload & ECTS Credits of The Course UNIT:	**BCETE405-S1**	**Management**	
Workload For Learning & Teaching Activities			
Type of the Learning Activities	**Learning Activities (# of week)**	**Duration (hours, h)**	**Workload (h)**
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	2	1	2
Laboratory	13	2	26
Reading	NA	NA	NA
Assignment (Homework)	3	1	3
Project Work	NA	NA	NA
Seminar	NA	NA	NA
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	NA	NA	NA
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	1	2
Final Exam	1	3	3
Preparation for the Final Exam	1	1	1
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	1	1
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	2	1.5	3
Total Workload of the Course Unit	**45**	**16**	**75**
Workload (h) / 25			**75÷25**
ECTS Credits allocated for the Course Unit			**3**

PROJECT1 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE406-S1	Project1	1	2	1	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Students of the Computer Engineering Department gain experience in basic design in their last year of study through the graduation project. Students can work anywhere in teams ranging in number from three to five students, with an average of three students per team. In addition, students are allowed to form their teams and select their graduation projects, which must be approved by the academic staff member who delivers the course. The main purpose of the project graduation course is to encourage the students to apply the knowledge they have acquired during their study. The projects need to integrate engineering criteria and realistic constraints, such as economic, environmental, moral, security, social, political, and sustainability-related considerations.
Contents of the Course Unit:	1- Project Selection and Proposal 2- Literature Review and Background Research 3- Project Planning and Design 4- Prototyping and Experimental Work

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students will dealing with:
1,2	**Project Selection and Proposal** • Introduction to project selection criteria and guidelines • Identifying a research problem or engineering challenge in biomedical engineering • Formulating a project proposal with clear objectives and scope
3,4,5	**Literature Review and Background Research** • Conducting a comprehensive literature review on the chosen project topic • Evaluating existing research and technologies relevant to the project • Analyzing and synthesizing information to inform the project design
6,7,8,9	**Project Planning and Design** • Developing a detailed project plan with milestones and timelines • Defining project requirements and specifications • Conceptualizing and designing solutions to address the identified problem or challenge
10,11,12,13,14	**Prototyping and Experimental Work** • Building prototypes or designing experiments to test and validate the proposed solution • Acquiring and assembling necessary components or materials for the project • Conducting experiments, data collection, and measurements as required

No.	PRACTICAL PART
	This part varies depending on the subject of the project which is differ from group to group

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE406-S1	PROJECT1	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	5	2	10
Reading	5	1	5
Assignment (Homework)	2	1	2
Project Work	2	2	4
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	1	1	1
Web Based Learning	3	1	3
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	3	1	3
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	1	5	5
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	5	5
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	NA	NA	NA
Preparation for the Short Exam	NA	NA	NA
TOTAL WORKLOAD OF THE COURSE UNIT	**35**	**32**	**58**
Workload (h) / 25			**58÷25**
ECTS Credits allocated for the Course Unit			**2.32**

EMBEDDED SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS(T+P)	CREDIT	ECTS CREDIT
BCETE401-S2	**Embedded Systems**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Basma MohammedKamal Younis**
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Introduce the students with FPGA design in Embedded Systems. the students will learn what an FPGA is and how this technology was developed, how to select the best FPGA architecture for a given application, how to use state of the art software tools for FPGA development and solve critical digital design problems using FPGAs.
Contents of the Course Unit:	1- Introduction to Embedded Systems and FPGAs 2- FPGA Programming technologies 3- Building Blocks 4- Programmable Logic 5- FPGA Architecture.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Embedded Systems :** What is an Embedded System? Generic Embedded System Architecture and applications
2	**Introduction to FPGA:** What are FPGAs? What can FPGAs used for? FPGA Design flow. Manufacturers(Xilinx and Altera)
3	**Programming technologies:** Fusible link, Anti-fuse ,PROMs, EPROM, EEPROM, FLASH, and SRAM-based technologies
4	**Basic Building Blocks** Read-only memory (ROM), Programmable ROMs, Multiplexers, decoders … etc.
5	**Basic Building Blocks** Different Design Examples
6	**Programmable Logic** PAL, PLA, GAL,SPLDs
7	**Programmable Logic** CPLDs, Altera CPLDs, Xilinx CPLDs. Macrocells.
8	**FPGA Architecture:** Configurable logic block, Configurable I/O standards and Programmable Interconnection
9	**FPGA Architecture:** Additional features: Embedded RAMs
10	**FPGA Architecture:** Additional features: Embedded multipliers, Clock managers... etc.
11	**FPGA Architecture:** Advanced architectures: (The Zynq Device: Processing System and Programmable Logic)
12	**Programmable logic design:** Using schematic entry design tools
13	**Zynq System-on-Chip Design:** IP Block Design
14	**Designing With Vivado High Level Synthesis**
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Embedded Systems design using VIVADO block design. ***Design Example :*** *AND,OR, XOR logic gates*
2	**Lab 2:** Embedded Systems design using VIVADO block design. ***Design Example :*** *full-adder*
3	**Lab 3**: Embedded Systems design using VIVADO block design. ***Design Example :*** *up/down binary counter*
4	**Lab 4:** Frequency Divider***: Design Example*** *BCD counter*
5	**Lab 5:** FPGA Distributed Memories : ***Design Example*** *:Read Only Memory (ROM)*
6	**Lab 6:** FPGA Block Memories ***: Design Example :****Random Access Memory (RAM)*
7	**Lab 7:** State Machines Design using VHDL***: Design Example*** *Gray code counter*
8	**Lab 8:** ROM-based Waveform Generator
9	**Lab 9:** A First-in First-out Memory
10	**Lab 10:** a 16-word, 8-bit Random Access Memory
11	**Lab 11:** Behavioural model of a 256-word, 8-bit Read Only Memory
12	**Lab 12:** Octal D-Type Register with 3-State Outputs
13	**Lab 13:** 8-bit Register with Synchronous Load and Clear
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE401-S2	EMBEDDED SYSTEMS	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

ELECTRONIC DEVICES Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE402-S2	**Electronic Devices**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's De gree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr.Ziad Saeed Mohammed**
Instructor(s) of the Course Unit	**Dr.Ziad Saeed Mohammed**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Course Objectives: Providing introductory of basic aspects of Integrated-Circuits (IC) Engineering: Materials, Fabrication, device behaviors. Analysis and design of digital circuits DTL, TTL, MOS, CMOS Analysis and design of static and variable circuits, studying the criteria that enter into the design such as speed, power, immunity against interference..
Contents of the Course Unit:	After successful completion of the course student will be able to: Know the characteristics of Pn junction device. Crystal growth of signal – crystal semiconductor layers and epitaxy. Describe the logic levels for CMOS and TTL u Discuss noise immunity u Determine the power dissipation of a logic circuit u Define the propagation delay time of a logic gate u Discuss speed-power product and explain its significance u Discuss loading and fan-out of TTL and CMOS.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	Introduction to semiconductor devices
2	Energy band theory (Insulator, conductor, semiconductor)
3	Pn junction Device definition and characteristics.
4	MS (Metal-semiconductor) junction
5	MOS (Metal-oxide-semiconductor) junction
6	Electronic devices fabrication technology and IC fabrication steps
7	Introduction to TTL, DRL, RTL, DTL, ECL, I'L, NMOS and CMOS digital circuits
8	NMOS inverter and NMOS digital circuit analysis.
9	CMOS inverter and CMOS digital circuit analysis
10	TTL digital circuit analysis
11	ECL digital circuit analysis
12	DTL digital circuit analysis
13	Fan-out in digital circuits
14	Noise margin in digital circuits
15	Final Exam

No.	PRACTICAL PART
1	Lab1: PN Junction diode characteristics A. Forward bias B. Reverse bias.
2	Lab2: Half wave Rectifier with and without filter, and Full wave Rectifier with and without filter.
3	Lab 3:Crystal growth of signal – crystal semiconductor layers and epitaxy.
4	Lab 4:Study the characteristics of CMOS inverter.
5	Lab 5:Study the characteristics of TTL digital circuit.
6	Lab 6: Study the characteristics of ECL digital circuit.
7	Lab 7: Study the characteristics of MOS (Metal-oxide-semiconductor) junction.
8	Lab 8: Study the characteristics of semiconductor devices.
9	Lab 9: Study the characteristics of Energy band theory (Insulator, conductor, semiconductor).
10	Lab 10: study the operation of MS (Metal-semiconductor) junction.
11	Lab 11: Fan-out in digital circuits.
12	Lab 12: Calculate the noise margin in digital circuits.
13	Lab 13: study the operation of Laser diode, LED diodes.
14	Lab 14: Effect of SiCl4 concentration on silicon epitaxial growth.

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE402-S2	ELECTRONIC DEVICES	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
Type of the Learning Activites	**Learning Activities (# of week)**	**Duration (hours, h)**	**Workload (h)**
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
Total Workload of the Course Unit	**73**	**54**	**150**
Workload (h) / 25			**150/25**
ECTS Credits allocated for the Course Unit			**6**

COMPUTER NETWORKS SYSTEMS Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE403-S2	**Computer Networks Systems**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ziyad Khalaf Farej**
Instructor(s) of the Course Unit	**Dr. Ziyad Khalaf Farej**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	The main objective of computer network systems is to enable communication and facilitate the exchange of information and resources between different computers and devices. Computer networks enable communication and data sharing, allowing users to access and utilize information and services from remote locations.
Contents of the Course Unit:	1- Introduction to Local Area Networks Standards 2- Data Link Layer Design Issues 3- Transport layer Process-la-Process Delivery 4- Network Layer 5- Wireless LANs

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	**Introduction to Local Area Networks Standards:** Medium Access Control, Ethernet (CSMA/CD) and Token MAC protocols
2	LAN performance; Token ring and CSMA/CD performance Evaluation
3	Introduction to Data-Link Layer; High-level Data Link Control (HDLC) and Point-to-Point Protocol (PPP)
4	**Data Link Layer Design Issues:** Framing, Error Control, and Flow Control
5	Automatic Repeat Request (ARQ), Stop-And-Wait Protocol and Sliding Window Protocols
6	Link Throughput, Utilization and Efficiency
7	Effect of Errors on Throughput Effect of Sliding Window and ARQ on Throughput
8	Introduction, Error Detection and Correction, Types of Errors, Redundancy, Forward Error Correction
9	Block Coding, Error detection, Cyclic Codes, Cyclic Redundancy Check, Hardware Implementation
10	**Transport layer; Process-la-Process Delivery** UDP, TCP and SCTP, Features and Connection
11	TCP Congestion Control, Timers Open loop and Close loop Congestion Control
12	**Network Layer:** Delivery, Forwarding, and Routing
13	Unicast Routing Protocols; Intra- and Interdomain Routing Multicast and Broadcast Routing Protocols
14	**Wireless LANs;** IEEE 802.11 Standards and Bluetooth
15	**Final Exam.**

No.	Practical Part
1	**Lab 1:** Introduction to wireless networks
2	**Lab 2:** Wireless network characteristics
3	**Lab 3**: IEEE 802.11 standards
4	**Lab 4:** Wireless Access point
5	**Lab 5:** Wireless Station
6	**Lab 6:** Data Routing Algorithm
7	**Lab 7:** Introduction to Network Management software
8	**Lab 8:** Mikrotik system
9	**Lab 9:** Mikrotik hardware devices
10	**Lab 10:** Winbox software
11	**Lab 11:** Firewall configuration
12	**Lab 12:** Hotspot management
13	**Lab 13:** User manager
14	**Lab 14:** Network advanced tools

Workload & ECTS Credits of The Course Unit :	**BCETE403-S2**	**Computer Networks Systems**	
Workload For Learning & Teaching Activities			
Type of the Learning Activities	Learning Activities (# of week)	Duration (hours, h)	Workload (h)
Lecture & In-Class Activities	15	2	30
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	6	1	6
Project Work	1	2	2
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	1	5
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	1	5
Final Exam	1	3	3
Preparation for the Final Exam	1	15	15
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	9	9
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1	8
Total Workload of the Course Unit	**70**	**43.5**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

ADVANCED COMPUTER ARCHITECTURE Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE404-S2	**Advanced Computer Architecture**	2	4	3	6

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Ahmad F. AL-Allaf**
Instructor(s) of the Course Unit	**Dr. Ahmad F. AL-Allaf**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	This course explores the basic architectures and principles used in the design of high-performance computers and processors. A range of processor architectures have been explored and compared. In each case we examine its advantages and limitations
Contents of the Course Unit:	1 – CISC and RISC architecture. 2 – Superscalar architecture 3 – Advance pipeline and VLIW architectures 4 – Multiprocessing, Multithreaded and multi-core processor architectures; 5 – NoC architecture

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to dealing with:
1	• **CISC and RISC architecture:** CISC and RISC philosophy, architecture and advantages and disadvantages. RISCs Design Principles
2	• **CISC and RISC architecture.** Examples of RISC processors (PowerPC, SPARC), architecture and features.
3	• **Superscalar architecture:** Superscalar processor architecture; Instruction-Level Parallelism (ILP)
4	• **Superscalar architecture:** Register flow techniques: • Register renaming and out of order execution,Types of Superscalar Processors
5	• **Advance pipeline architecture:** Pipeline hazards; exceptions; optimal pipeline depth;
6	• **Advance pipeline architecture:** Branch prediction; the branch target buffer
7	• **VLIW architecture:** VLIW processor architecture, Pipelining in FLIW Processors, example of VLIW processors.
8	• **Virtual memory system:** Virtual memory concepts and address translation, Translation Lookaside Buffers (TLBs), Mapping techniques, Page replacement policies, Advanced virtual memory techniques
9	• **Cache memory:** Cache organization and design, mapping of cache memory
10	• **Cache memory:** Updating policies, type of cache misses, cache coherence protocols.
11	• **Multithreaded and multi-core processor architectures:** Multicore processors and their organization, System Overview of Threading, Fundamental Concepts of Parallel and Thread Programming
12	• **Multiprocessor architectures:** Flynn's Taxonomy of Computer Architecture, SIMD Architecture, MIMD Architecture, Interconnection Networks. Shared and distributed memory system
13	• **Interconnection Networks:** Network-on-Chip (NoC) architectures, Routing algorithms in interconnection networks, Topologies and performance analysis of interconnection networks, Advanced network architectures (fat trees, hypercubes, etc.)
14	• **Emerging Trends in Computer Architecture:** Quantum computing basics, Neuromorphic computing, Approximate computing, Edge computing and IoT architectures
15	• **Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Introduction to the FPGA Laboratory
2	**Lab 2:** ALU circuit design
3	**Lab 3:** Sequential circuit design
4	**Lab 4**: Design simple RISC processor
5	**Lab 5:** Improve the performance of your RISC processor by adding some new instructions (multiplication and bit shifting
6	**Lab 6:** Implement a basic pipelined processor using a hardware description language (e.g., VHDL or Verilog).
7	**Lab 7:** Improve the performance of your pipeline processor by adding some new instructions
8	**Lab 8:** Simple VLIW processor
9	**Lab 9:** Improve the performance of your VLIW processor by adding some new instructions
10	**Lab 10:** Built in shared memory in FPGA
11	**Lab 11:** Design and simulate a simple Network-on-Chip architecture, Evaluate the performance of the NoC under different traffic patterns using different metrics such as latency, throughput, and packet delivery ratio.
12	**Lab 12: using the built-in hard-core processor**
13	**Lab 13: using the built-in soft-core processor**
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	**BCETE404-S2 ADVANCED COMPUTER ARCHITECTURE**		
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	15	**2**	**30**
Preliminary & Further Study	2	2	4
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	NA	NA	NA
Assignment (Homework)	8	1	8
Project Work	1	2	2
Seminar	3	1	3
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	5	2	10
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	5	2	10
Final Exam	1	3	3
Preparation for the Final Exam	1	20	20
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	4	0.5	2
Preparation for the Short Exam	8	1.5	12
TOTAL WORKLOAD OF THE COURSE UNIT	**73**	**54**	**150**
Workload (h) / 25			**150÷25**
ECTS Credits allocated for the Course Unit			**6**

MULTIMEDIA COMPUTING Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE405-S2	**Multimedia Computing**	2	4	3	5

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	**Dr. Fadwa S. Mustafa**
Instructor(s) of the Course Unit	**Dr. Fadwa S. Mustafa**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	• Clarifying the concept of multimedia computing, explaining its applications and components
Contents of the Course Unit:	1 – Introduction to Multimedia and Applications. 2 – Graphic and Image Data Representation. 3 – Images Digitization. 4 – Fundamental concepts in Video. 5 – Sound and Audio Basics.

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students/learners will or will be able to deal with:
1	**1- WHAT IS MULTIMEDIA?** Explaining the idea of multimedia, defining its applications that use multiple modalities to their advantage, including text, images, drawings (graphics), animation, video, and sound (including speech).
2	**2- Hypermedia and Hypertext Definitions and Applications** HTTP, URI, HTML, and XML Protocol.
3	**3- Graphics and Image Data Representations** The specifics of file formats for storing such images will also be discussed for graphics/image data types and Popular file formats
4	**4- Image Digitization** Digitization process to become suitable for digital processing, an image function f(x,y) must be digitized both spatially and in amplitude.
5	**5- Image Algebra.** Arithmetic and Logical Operations on Images.
6	**6- Image Histogram.** Histogram Modification and Histogram Equalization.
7	**7-Image Filters Techniques.** Spatial Domain and Frequency Domain.
8	**8- Image Segmentation.** Edge Segmentation, Region Segmentation, Point Detection, and Line Detection.
9	**9- Losses Compression Algorithms.** Run Length Encoding, Huffman encoding, Shannon Fano encoding, Arithmetic encoding, Lempel Ziv Welch encoding.
10	**10- Lossy Compression Algorithms.** Lossy compression algorithms are techniques that reduce the file size by discarding the less important information.
11	**11- Image Compression Standards** The JPEG standard specifies the codec.
12	**12- Fundamental Concept in Video** Component video, Visual Representation.
13	**13- Types of Video Signals.** Analog Video, Digital Video.
14	**14- Basics of Digital Audio.** A digital-to-analog converter, Digital Audio File Format.
15	**Final Exam.**

No.	PRACTICAL PART
1	**Lab 1:** Hypertext and Hypermedia Applications by using PowerPoint software.
2	**Lab 2:** Starting with the MATLAB program.
3	**Lab 3:** Basics of image processing (Import, Processing, and Export).
4	**Lab 4:** Image Conversion part1.
5	**Lab 5:** Image Conversion Part 2.
6	**Lab 6:** Rotating and cropping of images.
7	**Lab 7:** Separate Color Channels (Red, Green, and Blue) from RGB images.
8	**Lab 8:** Arithmetic Operations on Image Matrix.
9	**Lab 9:** Image Enhancement Point processing techniques (a histogram equalization technique).
10	**Lab 10:** Frequency domain techniques (filtering) with (filter2).
11	**Lab 11:** Filtering with im-filter.
12	**Lab 12:** Image Enhancement (Average filter).
13	**Lab 13:** Low-Frequency Filters on Image (Gaussian Filter).
14	**Lab 14:** Review

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE405-S2	**MULTIMEDIA COMPUTING**	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVATES	LEARNING ACTIVITIES (# OF THE WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	14	2	28
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	4	1	4
Laboratory	14	2	28
Reading	4	1	4
Assignment (Homework)	2	1	2
Project Work	1	3	3
Seminar	4	1	4
Internship	NA	NA	NA
Technical Visit	NA	NA	NA
Web Based Learning	1	5	5
Implementation/Application/Practice	2	2	4
Practice at a workplace	NA	NA	NA
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	NA	NA	NA
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	15	15
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	12	12
Short Exam (Quizzes)	2	0.5	1
Preparation for the Short Exam	4	1.5	6
TOTAL WORKLOAD OF THE COURSE UNIT	**58**	**54**	**125**
Workload (h) / 25			**125÷25**
ECTS Credits allocated for the Course Unit			**5**

PROJECT2 Programme Course Description

CODE	NAME OF THE COURSE UNIT	SEMESTER	IN-CLASS HOURS (T+P)	CREDIT	ECTS CREDIT
BCETE406-S2	Project2	2	2	1	2

GENERAL INFORMATION	
Language of Instruction:	**English**
Level of the Course Unit:	**Bachelor's Degree**
Type of the Course:	**Compulsory**
Mode of Delivery of the Course Unit	**Face to Face**
Coordinator of the Course Unit	
Instructor(s) of the Course Unit	**Dr. Basma MohammedKamal Younis**

OBJECTIVES AND CONTENTS	
Objectives of the Course Unit:	Students of the Computer Engineering Department gain experience in basic design in their last year of study through the graduation project. Students can work anywhere in teams ranging in number from three to five students, with an average of three students per team. In addition, students are allowed to form their teams and select their graduation projects, which must be approved by the academic staff member who delivers the course. The main purpose of the project graduation course is to encourage the students to apply the knowledge they have acquired during their study. The projects need to integrate engineering criteria and realistic constraints, such as economic, environmental, moral, security, social, political, and sustainability-related considerations.
Contents of the Course Unit:	1- Experimental Work 2- Data Analysis and Interpretation 3- Documentation and Reporting 4- Presentation and Demonstration 5- Project Evaluation and Reflection

Week	KEY LEARNING OUTCOMES OF THE COURSE UNIT On successful completion of this course unit, students will dealing with:
1,2,3	**Experimental Work** • Conducting experiments, data collection, and measurements as required
4,5,6	**Data Analysis and Interpretation** • Analyzing experimental or collected data using appropriate statistical or analytical methods • Interpreting and drawing conclusions from the data • Iterating and refining the project design based on data analysis results
7,8,9	**Documentation and Reporting** • Documenting the project progress, including design decisions, experimental setups, and results • Writing technical reports or project documentation • Creating visual aids (e.g., diagrams, graphs, charts) to effectively communicate the project findings
10,11,12	**Presentation and Demonstration** • Preparing and delivering a final project presentation to an audience of peers, instructors, or industry professionals • Demonstrating the project functionality, experimental setup, or design outcomes • Addressing questions and feedback from the audience
13,14,15	**Project Evaluation and Reflection** • Conducting self-evaluation and reflection on the project outcomes, strengths, and areas for improvement • Participating in project evaluation sessions with instructors or evaluators • Providing constructive feedback to peers on their projects

No.	PRACTICAL PART
	This part varies depending on the subject of the project which is differ from group to group

WORKLOAD & ECTS CREDITS OF THE COURSE UNIT :	BCETE406-S2	PROJECT2	
WORKLOAD FOR LEARNING & TEACHING ACTIVITIES			
TYPE OF THE LEARNING ACTIVITES	LEARNING ACTIVITIES (# OF WEEK)	DURATION (HOURS, H)	WORKLOAD (H)
Lecture & In-Class Activities	NA	NA	NA
Preliminary & Further Study	NA	NA	NA
Land Surveying	NA	NA	NA
Group Work	5	1	5
Laboratory	5	2	10
Reading	5	1	5
Assignment (Homework)	2	1	2
Project Work	2	2	4
Seminar	2	1	2
Internship	NA	NA	NA
Technical Visit	1	1	1
Web Based Learning	3	1	3
Implementation/Application/Practice	NA	NA	NA
Practice at a workplace	3	1	3
Occupational Activity	NA	NA	NA
Social Activity	NA	NA	NA
Thesis Work	1	5	5
Field Study	NA	NA	NA
Report Writing	2	2	4
Final Exam	1	3	3
Preparation for the Final Exam	1	5	5
Mid-Term Exam	1	2	2
Preparation for the Mid-Term Exam	1	4	4
Short Exam (Quizzes)	NA	NA	NA
Preparation for the Short Exam	NA	NA	NA
TOTAL WORKLOAD OF THE COURSE UNIT	**35**	**32**	**58**
Workload (h) / 25			**58÷25**
ECTS Credits allocated for the Course Unit			**2.32**